**Fishery Data Series No. 11-22**

# Origins of Chinook Salmon in the Yukon River Fisheries, 2006

**by**

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**Alaska Department of Fish and Game** **Divisions of Sport Fish and Commercial Fisheries**

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**Weights and measures (metric)**

| | |
|---|---|
| centimeter | cm |
| deciliter | dL |
| gram | g |
| hectare | ha |
| kilogram | kg |
| kilometer | km |
| liter | L |
| meter | m |
| milliliter | mL |
| millimeter | mm |

**Weights and measures (English)**

| | |
|---|---|
| cubic feet per second | $ft^3/s$ |
| foot | ft |
| gallon | gal |
| inch | in |
| mile | mi |
| nautical mile | nmi |
| ounce | oz |
| pound | lb |
| quart | qt |
| yard | yd |

**Time and temperature**

| | |
|---|---|
| day | d |
| degrees Celsius | °C |
| degrees Fahrenheit | °F |
| degrees kelvin | K |
| hour | h |
| minute | min |
| second | s |

**Physics and chemistry**

| | |
|---|---|
| all atomic symbols | |
| alternating current | AC |
| ampere | A |
| calorie | cal |
| direct current | DC |
| hertz | Hz |
| horsepower | hp |
| hydrogen ion activity (negative log of) | pH |
| parts per million | ppm |
| parts per thousand | ppt, ‰ |
| volts | V |
| watts | W |

**General**

| | |
|---|---|
| Alaska Administrative Code | AAC |
| all commonly accepted abbreviations | e.g., Mr., Mrs., AM, PM, etc. |
| all commonly accepted professional titles | e.g., Dr., Ph.D., R.N., etc. |
| at | @ |
| compass directions: | |
| east | E |
| north | N |
| south | S |
| west | W |
| copyright | © |
| corporate suffixes: | |
| Company | Co. |
| Corporation | Corp. |
| Incorporated | Inc. |
| Limited | Ltd. |
| District of Columbia | D.C. |
| et alii (and others) | et al. |
| et cetera (and so forth) | etc. |
| exempli gratia (for example) | e.g. |
| Federal Information Code | FIC |
| id est (that is) | i.e. |
| latitude or longitude | lat. or long. |
| monetary symbols (U.S.) | $, ¢ |
| months (tables and figures): first three letters | Jan,...,Dec |
| registered trademark | ® |
| trademark | ™ |
| United States (adjective) | U.S. |
| United States of America (noun) | USA |
| U.S.C. | United States Code |
| U.S. state | use two-letter abbreviations (e.g., AK, WA) |

**Mathematics, statistics**

| | |
|---|---|
| *all standard mathematical signs, symbols and abbreviations* | |
| alternate hypothesis | $H_A$ |
| base of natural logarithm | *e* |
| catch per unit effort | CPUE |
| coefficient of variation | CV |
| common test statistics | (F, t, $\chi^2$, etc.) |
| confidence interval | CI |
| correlation coefficient (multiple) | R |
| correlation coefficient (simple) | r |
| covariance | cov |
| degree (angular ) | ° |
| degrees of freedom | df |
| expected value | *E* |
| greater than | > |
| greater than or equal to | ≥ |
| harvest per unit effort | HPUE |
| less than | < |
| less than or equal to | ≤ |
| logarithm (natural) | ln |
| logarithm (base 10) | log |
| logarithm (specify base) | $\log_2$, etc. |
| minute (angular) | ' |
| not significant | NS |
| null hypothesis | $H_O$ |
| percent | % |
| probability | P |
| probability of a type I error (rejection of the null hypothesis when true) | α |
| probability of a type II error (acceptance of the null hypothesis when false) | β |
| second (angular) | " |
| standard deviation | SD |
| standard error | SE |
| variance | |
| population | Var |
| sample | var |

*FISHERY DATA SERIES NO. 11-22*

# ORIGINS OF CHINOOK SALMON IN THE YUKON RIVER FISHERIES, 2006

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# ABSTRACT

The stock composition of all harvests of Chinook salmon *Oncorhynchus tshawytscha* within the Yukon River drainage was estimated in 2006. Stock composition proportions were estimated for three geographically-based stock groups termed Lower, Middle, and Upper. Age composition of the harvests were estimated from scales collected in each respective harvest or estimated from similar harvests. Genetic stock identification was used to estimate stock composition for the most abundant age classes: age-1.3 and age-1.4 fish, or from all ages combined in Districts 1 through 5 harvests. Observed age composition ratios among escapements, in combination with genetic estimates for analogous age classes, were used to estimate the stock composition of the less abundant age classes. Districts 1, 2, 3, and 5 commercial harvests and Districts 1, 4, and 5 subsistence harvests were apportioned to stock groups using estimates from genetic samples collected in each respective harvest. Districts 2 and 3 subsistence harvests were apportioned using samples from other harvests. District 6, Canadian, and portions of District 5 subsistence harvests were assigned to stock group based on geographic location. The total estimated Yukon River harvest in 2006 was 104,225 Chinook salmon; of those, 17.6% were estimated to be of Lower, 27.6% Middle and 54.9% Upper Yukon River origin.



Key words: Chinook salmon, *Oncorhynchus tshawytscha*, Yukon River, stock composition, age composition, commercial harvest, subsistence harvest, genetic stock identification, age-1.3, age-1.4, Canadian harvest, stock groups.


# INTRODUCTION

The Yukon River drains an area of 330,000 square miles, originates in northern British Columbia, and flows 2,300 miles to the Bering Sea (Hayes et al. 2008). Chinook salmon *Oncorhynchus tshawytscha*, spawn in major tributaries throughout the drainage, such as the Andreafsky River, 104 river miles (rm) from the mouth of the Yukon River, and nearly 1,900 rm upriver in the Swift River, British Columbia, near the Yukon Territory border. More than 100 spawning streams have been documented in the Yukon River drainage.

Yukon River Chinook salmon are harvested annually in various fisheries in both marine and fresh waters. Within the Yukon River, returning adult salmon are harvested in subsistence and personal use fisheries in Alaska, Aboriginal and domestic fisheries in Canada, and commercial and sport fisheries in Alaska and Canada (Figures 1 and 2). Commercially sold harvests consist of fish sold in the round, fish utilized for commercial roe harvests, and fish harvested by the Alaska Department of Fish and Game (ADF&G) in test fishing projects. Sport fisheries primarily occur in tributaries of the Tanana River and in Canada; smaller sport fishing harvests occur throughout the Alaska portion of the Yukon River drainage. The total annual harvest of Chinook salmon within the Yukon River drainage based on the 1996 to 2005 average was 111,054 fish, of these; approximately 90% were harvested in Alaska (JTC 2007).

The United States (U.S.) and Canada have been engaged in the cooperative management and conservation of stocks spawning in Canada since 1985 when a Memorandum of Understanding was incorporated into the Pacific Salmon Treaty. In 2002, the Yukon River Salmon Agreement was signed as part of the Pacific Salmon Treaty, whereby both nations agreed to harvest sharing of Chinook salmon stocks that migrate through U.S. waters and spawn in Canada.

To fulfill treaty obligations and evaluate stock production to effectively assess spawning escapement goals and management strategies requires information on the stock composition of the various Yukon River mixed stock harvests. From 1981 through 2003, stock composition of Yukon River drainage Chinook salmon harvests was estimated using scale pattern analysis and reported in an annual report series (e.g. DuBois 2005). Schneiderhan (1997) provided a summary of analysis methods historically used in the stock identification project. A program developed by

Bromaghin and Bruden (1999) improved analytical methods and Lingnau (2000) reprocessed the historical data using the new method.

Based on surveys of genetic variation among Chinook salmon populations in the Yukon River drainage a baseline of genetic information was completed and used for genetic stock identification using allozyme loci (Templin et al. 2005). Two types of genetic markers, single nucleotide polymorphisms (SNPs) and microsatellites have been investigated to provide a replacement for the allozyme baseline. A survey of SNPs in Yukon River Chinook salmon (Smith et al. 2005) demonstrated that stock identification information could be obtained in an accurate and efficient manner using recently developed genetic methods. In 2004, ADF&G estimated the stock composition of Yukon River fishery harvests using mixed stock analysis based on a 23-population baseline and 17 SNPs markers to differentiate Chinook salmon stock groups (Templin et al. 2006a; DuBois et al. 2009). The stock composition of the 2005 Chinook salmon harvest was estimated using 13 microsatellite markers and a 19-population baseline (Templin et al. 2006b; DuBois and DeCovich 2008).

Aerial surveys of Chinook salmon escapements indicate that the largest concentrations of spawning salmon occur in tributary groupings in three distinct geographic regions: 1) Alaskan tributary streams draining the Andreafsky Hills and Kaltag Mountains (rkm 161-805); 2) Alaskan tributary streams in the Upper Koyukuk River and Tanana River basins (rkm 1,290-1,770); and 3) Canadian tributary streams draining the Pelly and Big Salmon Mountains (rkm 2,090-2,900). Initially, McBride and Marshall (1983) termed Chinook salmon stocks within these geographic regions “runs” but Lingnau and Bromaghin (1999) now refer to these as Lower, Middle, and Upper Yukon River stock groups. Templin et al. (2008) refers to these as broad-scale groups: Lower Yukon, Middle Yukon, and Canada.

The goal of this project was to estimate the proportional harvest of stock groups (i.e., geographic region) for all Chinook salmon harvested in the Yukon River drainage during the 2006 season. The stock-specific proportional harvest was estimated using genetic and age data collected from harvest samples, escapement age composition data collected from spawning grounds, and geographic location of harvests.

In 2006, stock composition from Chinook salmon harvest samples was estimated using a 25-population baseline and 26 SNPs markers (Templin et al. 2008). This report apportions annual harvests within the drainage to Lower, Middle, and Upper stock groups based upon the previously defined geographic stock groups combined with the three broad scale reporting groups from the 26 SNPs markers. The Lower stock group includes Alaskan tributary streams from the Andreafsky River to near the confluence with the Tanana River and the lower Koyukuk River drainage. The Middle stock group includes Alaskan tributary streams upstream from the Tanana River confluence, and the upper Koyukuk and Tanana river drainages. The Upper stock group is Canadian-origin fish.

## OBJECTIVE

The objective was to estimate the Chinook salmon harvest by age and stock group for all fisheries that occurred in the Yukon River drainage during 2006.

# METHODS

## SCALE COLLECTION, PROCESSING, AND AGING

Chinook salmon were sampled for age, sex, and length from commercial, subsistence, and test fisheries within the Yukon River drainage. Scales were removed from the preferred area of the fish for age determination and mounted on gum cards (INPFC 1963). Three or more scales were collected from each fish to allow for the incidence of regenerated scales. The scales were impressed in cellulose acetate using methods described by Clutter and Whitesel (1956). Scale impressions were magnified and examined in a Microfiche reader. Age was determined by counting the number of freshwater and marine annuli, the regions of the scale where the circuli are tightly spaced representing slower growth rates associated with winter conditions (Mosher 1969). Ages were recorded using European notation, number of freshwater annuli separated by a decimal from number of marine annuli (Koo 1962). Total age from the brood year is the sum of freshwater and marine annuli plus one to account for time spent in the gravel before hatching. ADF&G staff processed the Alaskan fish age data using various summary output programs, and weighted the age summaries by harvest and escapement estimates when available (Bales 2008).

## ESCAPEMENT SAMPLING

During peak spawning mortality, ADF&G personnel collected scale samples from carcasses at the Anvik, Chena, and Salcha rivers. U.S. Fish and Wildlife Service (USFWS) crews sampled live salmon at weir projects on the East Fork Andreafsky and Gisasa rivers. The U.S. Bureau of Land Management crew sampled fish at the Tozitna River weir. Age composition from each of these projects was weighted by the escapement and summed to estimate the escapement age composition of the Lower and Middle stock groups (Table 1).

Samples were collected by Canadian Department of Fisheries and Oceans (DFO) from fish captured in fish wheels at White Rock and Sheep Rock in the Yukon Territory, Canada. The escapement age composition of the fish wheel catches was not used directly. Fish wheels preferentially harvest younger fish; therefore, the age composition of fish wheel catches does not represent the true age of the Upper stock group. In 1996, a comparative analysis of historical Canadian age data from fish wheels, commercial gillnets, and spawning ground escapements was conducted (Jeff Bromaghin, Commercial Fisheries Biologist, ADF&G, unpublished memorandum). Selectivity coefficients developed from this analysis were applied to the fish wheel catch age composition, and the resulting age composition (termed “upriver adjusted”) is a more accurate estimate for the escapement age composition of the Upper stock group (Table 1).

## GENETIC SAMPLING

Genetic sampling was included with the age, sex, and length (ASL) sampling routine to pair the genetic sample with the correct scale sample and associated data. The ADF&G Gene Conservation Laboratory used axillary process tissue samples from individual fish to determine the genetic characteristics of a particular run or stock of fish. The axillary process was removed from each fish and put into an individually numbered vial and filled with denatured ethanol. Each vial number was recorded with the paired ASL data information. Some subsistence harvest sampling locations collected bulk samples e.g., individual fish were not paired with ASL data. The sample goal for each commercial period was 400 fish and varied from 250 to 400 fish for subsistence harvests.

Where age-structured harvest estimates were available, the individuals from each sampling event were separated into age-1.3 and age-1.4 fish. Mixed stock analysis was performed on these ages separately following the procedures described by Templin et al. (2008) Where age-structured harvest estimates were not available, due to bulk sampling, or sample sizes were judged inadequate to provide separate estimates by age, all samples combined were analyzed. These combined samples are referred to as all ages combined even though some of the combined samples were from fish not aged.

In total, genetic tissue was collected from 5,090 individual fish; of these, 4,552 were used in analyses (Table 2).

## HARVEST BY AGE AND STOCK GROUP

Harvest data from 2006 were compiled from a variety of sources and apportioned by age and stock group for a Yukon River total harvest estimate. Commercial harvest of Chinook salmon in Alaska, by district and period, were from Hayes and Clark 2006. Subsistence harvest estimates in Alaska, by district and village, were from Bill Busher, Commercial Fisheries Biologist, ADF&G, personal communication. Sport fish harvest estimates in Alaska were from Audra Brase, Sport Fish Biologist, ADF&G, Fairbanks (personal communication). Canadian harvests from commercial, aboriginal, domestic, and sport fisheries were from JTC 2007 and Patrick Milligan, Department of Fisheries and Oceans, Whitehorse, Yukon Territory (personal communication). Age composition estimates in Alaska were from Bales 2008. Age composition estimates in Canada were from Patrick Milligan (personal communication). Stock composition estimates were from Templin et al. 2008 and Nick DeCovich (Gene Conservation Laboratory, ADF&G, Anchorage, personal communication).

The age composition of harvests may be estimated in one of two ways. If age data are available from a harvest sample, age composition estimates are applied to the harvest. If age data are not available from the harvest, the age composition may be estimated using the age composition from one or more harvests presumed to have similar age composition.

The stock composition of harvests may be estimated in one of four ways. If genetic data are available from a harvest sample by major age, genetic stock composition estimates are apportioned to each major age, and the stock composition of the minor ages are estimated using the method described by Schneiderhan (1997). If genetic data are available from a harvest sample by all ages combined, the genetic stock composition estimates are apportioned to each age. If genetic data are not available from the harvest, the stock composition may be estimated using the stock composition from one or more harvests presumed to have similar stock composition. The harvest may also be assigned to a particular stock group based on the geographic location of the harvest. Age-specific stock composition estimates are multiplied by the size of the harvest, resulting in the estimated number of fish harvested by stock group and age.

### Harvest stock composition by major age classes

From June through July, commercial and subsistence harvests were sampled and directly used to estimate the age and stock composition from each respective harvest. Age composition was applied to each harvest, by period, when available. Stock composition of the major age classes, age-1.3 and age-1.4 fish, was used to apportion the harvest, by period, if applicable. ADF&G crews sampled Chinook salmon for age and genetic data from all 5 commercial periods in

District 1 and 4 of 6 periods in District 2. All of the sampling occurred at the processor's facilities in Districts 1 and 2. All of these commercial periods except one (District 2, period 2) were unrestricted mesh where any mesh size within regulation could be used. Commercial harvests in Districts 3 and 6 were estimated using different methods, and no commercial harvests occurred in District 4.

ADF&G crews collected age and genetic data from 3 of 5 commercial periods in District 5 (Subdistricts 5-B and 5-C). These fish were sampled after delivery to the processor in North Pole, near Fairbanks. Age data from each period were applied to the harvest. Genetic data from the three sampled periods were pooled and applied to each respective harvest by major age class. Periods not sampled were estimated using different methods.

The age and genetic data collected from the District 1 subsistence harvest samples were used to estimate age and stock composition for that harvest. Sampling of this harvest was conducted by ADF&G staff stationed in Emmonak. Most of the District 1 subsistence harvest occurred during early to mid-June, and preceded the commercial fishery. Subsistence harvests in Districts 2 and 3 were estimated using a different method.

District 4 age and stock composition estimates were divided between mainstem and upper Koyukuk River harvests. Mainstem Yukon River mixed stock subsistence harvests in District 4 occur along 375 river miles, from the District 3/4 boundary, at the mouth of the Bonasila River (rm 306) to the District 4/5 boundary at the mouth of the Tozitna River (rm 681; Figure 1; Hayes et al. 2008).

The District 4 subsistence harvest age and stock composition, from mixed stocks harvested along the mainstem Yukon River, was estimated by pooling samples from selected harvest locations and applying those estimates to specific harvests by village. The City of Kaltag collected age and genetic data from Chinook salmon harvested in the subsistence fishery in large-mesh gillnets fished near Kaltag (rm 450). The Yukon River Drainage Fishermen's Association (YRDFA) employed technicians to collect age and genetic data from harvest sites near Nulato (rm 484), Bishop Rock (rm 514), and Galena (rm 530) from both set and drift gillnets. Age and genetic data from samples collected near Kaltag and Nulato were pooled and applied to subsistence harvests from the villages of Anvik, Grayling, Kaltag, and Nulato; all of these villages are between rm 317 and rm 484. Age composition data from samples collected near Bishop Rock and Galena were pooled and applied to subsistence harvests from the villages of Koyukuk and Galena. Stock composition estimates for these two villages were from the Bishop Rock genetic data. Other subsistence harvests in Districts 4, 5, and 6 were estimated using different methods.

## Harvest stock composition by minor age classes

All locations where the stock composition of age-1.3 and age-1.4 fish were directly estimated from age-specific genetic data also had harvests of the less frequent age classes apportioned to stock group based on escapement age composition and the stock composition of analogous age classes as described by Schneiderhan 1997. The escapement age compositions, by stock group, were used to estimate the proportion of the minor age classes in each harvest. McBride and Marshall (1983) developed assumptions whereby the stock composition from major age classes were used to estimate the stock composition of minor age classes, e.g., age-1.3 was used to estimate age-1.1,-1.2, -2.2, and -2.3; and age-1.4 was used to estimate age-1.5, -2.4, -1.6, and -2.5.

## Harvest stock composition by all ages combined

Some stock composition estimates were not available by major age classes, primarily due to inadequate sample sizes or lack of paired age information. In these instances, the genetic samples collected were combined and the resulting stock composition was used to apportion each age. Not all of the harvests apportioned by this method had age data that were collected from the harvest.

ADF&G collected age and genetic data from the District 3, period 1 commercial harvest. Stock composition of this harvest was estimated from all genetic samples combined because of a small sample size, and the age composition was applied to the harvest.

The YRDFA collected age and genetic data from subsistence harvests near Ruby (rm 581) from set gillnets and fish wheels. Stock composition of this harvest was estimated from all genetic samples combined, and the age composition was applied to the subsistence harvest in Ruby.

Subsistence stock composition estimates in District 5 were separated by location: harvests downstream of Fort Yukon (rm 681 to rm 1,002), harvests from Chandalar and Black rivers, and harvests upstream of and including Fort Yukon (rm 1,002 to rm 1,224). Genetic samples were collected from Chinook salmon harvested in fish wheels at Rampart Rapids (rm 731) in Subdistrict 5-B, however paired age data were not collected. The subsistence harvest stock composition from villages in District 5 downstream of Fort Yukon was estimated from the pooled genetic data collected at Rampart Rapids. The age composition from the District 5 commercial fishery was applied to all subsistence harvests in District 5.

## Harvest stock composition from other sources

Age and stock composition of harvests not sampled were estimated from other harvests that were presumed to be similar. These similar harvests may be from an adjacent harvest or from a pooling of test, commercial, or subsistence fishery data. Different data sources may be used to estimate the age or stock composition depending upon available data.

Three commercial periods were not sampled in the lower river. In District 2, Age and stock estimates from period 3 were applied to period 2, and period 5 was applied to period 6. In District 3, period 1 was applied to period 2.

Two of five commercial periods were not sampled in District 5. Age composition from period 1 was applied to period 2 and period 4 was applied to period 5. Genetic data from periods 1, 3, and 4 were pooled and used to estimate the stock composition of all commercial periods in District 5.

The subsistence harvest in District 2 was not sampled. District 2 subsistence age composition estimates were based on pooled samples collected from the District 1 subsistence harvest, the District 2 commercial harvest (periods 1 and 3); and the Pilot Station Sonar Test Fishery from $\geq$ 5-inch mesh sizes. District 2 stock composition estimates were based on pooled samples from the District 1 subsistence harvest and the District 2 commercial harvest (periods 1 and 3).

The subsistence harvest in District 3 was not sampled. District 3 subsistence age composition estimates were based on pooled samples collected from the District 3 commercial harvest, the Pilot Station Sonar Test Fishery from $\geq$5-inch mesh sizes, and the Marshall Test Fishery. District 3 stock composition estimates were based on pooled samples collected from the District 3 commercial harvest and the District 2 commercial harvest (periods 1 and 3).

### Harvests assigned by stock group

Harvests that do not occur in the mainstem Yukon River were assigned to stock group based on geographic location. Subsistence harvests in District 4, those from upper Koyukuk River villages (Alatna, Allakaket, Bettles, Hughes, and Huslia) were assigned to the Middle stock group based upon genetic classification of the baseline samples collected from this area (South Fork Koyukuk River and Henshaw Creek; Templin et al. 2005; Smith et al. 2005). Age composition from the Chinook salmon escapement at the Gisasa River weir, a tributary of the lower Koyukuk River, was applied to the upper Koyukuk River subsistence harvest.

The Chandalar and Black rivers subsistence harvest in District 5 was assigned to the Middle stock group because these fish are bound for spawning grounds in Alaska. Subsistence harvests from villages upstream of and including Fort Yukon in District 5 were assigned to the Upper stock group assuming these fish are bound for Canada. The age composition from the District 5 commercial fishery was applied to all subsistence harvests in District 5.

The stock composition of all harvests occurring in District 6, Tanana River, was assigned to the Middle stock group based on geographic location. Six commercial periods occurred in District 6, however, the Chinook salmon harvest was small ($n$=84) and none of the harvests were sampled. Age composition of the commercial, subsistence, and sport fishery harvests in District 6 were estimated from escapement sampling in the Chena and Salcha rivers. Tributaries in the Tanana River drainage, specifically the Chena and Salcha rivers, support most of the sport fishery harvest in Alaska.

All harvests occurring in Canada were assigned to the Upper stock group. The upriver adjusted harvest from the fish wheel catches was used to estimate the age composition of Canadian commercial, domestic, sport, and aboriginal harvests. In 1996, a comparative analysis of historical Canadian age information from fish wheels, commercial gillnets, and spawning ground escapements was conducted (Jeff Bromaghin, Commercial Fisheries Biologist, ADF&G, Anchorage, unpublished memorandum). Selectivity coefficients from this analysis were applied to the observed fish wheel catch age composition, and the resulting age composition (termed “upriver adjusted”) is the preferred estimate for the Canadian border passage age composition.

# RESULTS

## AGE COMPOSITION

Age data from seven locations were used to estimate the escapement age composition of the three stock groups. The weighted age composition proportion for the Lower stock group was predominantly age-1.3 (0.579) followed by age-1.4 fish (0.225; Table 1). The Middle stock group was mostly age-1.3 (0.484) and age-1.4 fish (0.423). The Upper stock group age composition, from the adjusted fish wheel ages in Canada, was age-1.4 (.496) and age-1.3 fish (0.479).

Age data collected from 14 locations were used to estimate harvest age composition (Table 2). Overall, age-1.3 Chinook salmon were the most abundant age class from commercial, subsistence, and test fishery sampling locations in Alaska and Canada. Age-1.4 fish were slightly more abundant only in the District 1 commercial sample. Bales (2008) provides age composition from all Chinook salmon sampling projects in the Yukon River Area.

## GENETIC SAMPLES

In 2006, genetic samples from 4,552 Chinook salmon were used to estimate the stock composition of mainstem Yukon River mixed-stock harvests (Table 3). The majority of the samples were from the District 1 and 2 commercial harvests. Subsistence harvest samples were from six locations.

## GENETIC ANALYSIS FOR MAJOR AGE CLASSES

A total of 1,726 samples were analyzed for stock identification by major age class from five fishing periods in the District 1 commercial harvest: 829 were age-1.3 and 897 were age-1.4 fish. The Upper stock proportion estimates were high (>0.502), for both ages, from the first two periods and for age-1.4 fish in the last period. The Lower stock proportion estimates were largest in period 4 for both ages. The Middle stock proportion estimates were largest in period 1 and had a relatively narrow range (0.082–0.190) in the other four periods. In general, Upper stock proportion estimates were greater for age-1.4 fish and Middle stock estimates were greater for age-1.3 fish (Table 4 and Figure 3).

A total of 1,416 samples were analyzed by major age class from four fishing periods in the District 2 commercial harvest: 784 were age-1.3 and 632 were age-1.4 fish. The Upper stock proportion estimates were highest in the first two periods for both ages. The highest Lower stock proportion estimates for both ages were in the last two periods (Table 5 and Figure 4).

A total of 379 samples were analyzed by major age class from three combined fishing periods in the District 5 commercial harvest: 289 were age-1.3 and 90 were age-1.4 fish. The Middle stock proportion estimates were highest for age-1.3 fish at 0.509, and comprised 0.332 of the age-1.4 fish. The Lower stock proportion contributes little, if any, to the District 5 commercial harvest (Table 6 and Figure 5).

A total of 551 samples were analyzed by major age class from subsistence harvests in Districts 1 and 4. The Upper stock proportion estimates were highest for both ages in the District 1 samples. In the combined samples from Kaltag and Nulato, the Middle stock proportion estimates were highest for age-1.4 fish and the Upper stock proportion estimates were highest for age-1.3 fish. In the samples from Bishop Rock, the Middle stock proportion estimates were highest for age-1.3 fish and the Upper stock proportion estimates were highest for age-1.4 fish (Table 6 and Figure 5).

## GENETIC ANALYSIS FOR ALL AGES COMBINED

A total of 480 samples were analyzed for stock identification by all ages combined from the commercial harvest in District 3 and subsistence harvests in District 4 (Ruby) and District 5 (Rampart Rapids). The Upper stock proportion estimates predominated in Districts 3 and 5 and the Middle stock proportion estimates predominated in District 4 (Table 6 and Figure 5).

## HARVEST STOCK COMPOSITION BY DISTRICT AND FISHERY

All Yukon River harvests, by district and fishery, were apportioned to age by stock group. Harvest stock composition by district and fishery are shown in Tables 7 through 10 by age, and in Figure 6 for all ages combined. The larger harvests, by district and fishery, are referenced in the following results. Readers should refer to tables for additional details of the smaller harvests.

The 24,545 Chinook salmon harvested in the District 1 commercial fishery were composed of an estimated 8,389 (0.342) Lower, 4,797 (0.195) Middle, and 11,359 (0.463) Upper stock fish (Tables 7 and 10). In numbers of fish, the Upper stock group in the District 1 commercial harvest was second only to the District 5 subsistence harvest (Figure 6). Age-1.4 fish comprised one-half (12,217 fish) of the harvest followed by age-1.3 fish (11,480, Table 7).

The 5,122 Chinook salmon harvested in the District 1 subsistence fishery were composed of an estimated 1,089 (0.213) Lower, 1,787 (0.349) Middle, and 2,247 (0.439) Upper stock fish. In numbers of fish, the Upper stock group in this fishery was the smallest, by district, of any mainstem Yukon River subsistence harvest. Age-1.3 fish comprised more than one-half (2,777 fish) of this harvest (Tables 9–10; Figure 6).

The 19,834 Chinook salmon harvested in the District 2 commercial fishery were composed of an estimated 6,149 (0.310) Lower, 5,091 (0.257) Middle, and 8,594 (0.433) Upper stock fish. Age-1.3 fish comprised over one-half (10,545 fish) of the harvest followed by age-1.4 fish (8,672). In numbers of fish, the Middle stock group harvest in the District 2 commercial harvest was second only to the District 4 subsistence harvest (Tables 8 and 10; Figure 6).

The 8,039 Chinook salmon harvested in the District 2 subsistence fishery were composed of an estimated 962 (0.120) Lower, 2,987 (0.372) Middle, and 4,090 (0.509) Upper stock fish. Age-1.3 fish comprised well over one-half (0.572) of the harvest (Tables 9 and 10).

The 5,374 Chinook salmon harvested in the District 3 subsistence fishery were composed of an estimated 408 (0.076) Lower, 2,083 (0.388) Middle, and 2,883 (0.536) Upper stock fish. Age-1.3 fish comprised more than one-half (0.052 fish) of this harvest (Tables 9 and 10).

The 12,022 Chinook salmon harvested in the District 4 subsistence fishery were composed of 1,125 (0.094) Lower, 5,612 (0.467) Middle, and 5,284 (0.440) Upper stock fish. In proportion by stock, the Middle stock group in this fishery was the highest, by district, of any mainstem Yukon River subsistence harvest. Age-1.3 fish comprised one-half (6,058 fish) of this harvest (Tables 9–10; Figure 6).

In District 5, the commercial and subsistence age composition are identical because samples from the former were used to estimate both. Age-1.3 fish (0.679) predominated these harvests, followed by age-1.4 (0.211) and age-1.2 fish (0.102. The 15,924 Chinook salmon harvested in the District 5 subsistence fishery were composed of 101 (0.006) Lower, 3,219 (0.202) Middle, and 12,604 (0.792) Upper stock fish. In both numbers of fish and proportion by stock, the Upper stock group in this fishery was the highest, by district, of any mainstem Yukon River harvest. In contrast, the commercial harvest in District 5 had an estimated one-half (0.499) Middle stock group (Tables 9–10; Figure 6).

The District 6 harvest of 2,140 fish was assigned to the Middle stock group. Age-1.3 and age-1.4 fish were present in near equal proportions (Tables 9–10; Figure 6).

The Canadian harvest of 9,072 Chinook salmon was assigned to the Upper stock group. The Canadian harvest comprised 2,332 commercial, 6,071 aboriginal (includes Porcupine River harvest near Old Crow), 63 domestic, and 606 sport harvested fish. Age-1.3 fish were 0.479 and age-1.4 fish were 0.496 of the harvest (Tables 9–10; Figure 6).

## TOTAL HARVEST

In 2006, the Chinook salmon total harvest for U.S. and Canada was 104,225 fish. The U.S. harvest total of 95,153 fish (0.913) was greater than the 5-year average (2001–2006) and less than the overall average; as low harvests in 2001 and 2002 decreased the 5-year average. The U.S. harvest proportion was more than the 5-year and overall averages (Tables 11 and 12).

The Upper stock was the largest estimated component of the total harvest, contributing 57,169 fish, or 0.549 of the harvest. The Upper stock group harvest by country was 48,097 fish by the U.S. and 9,072 fish by Canada. In recent years, The U.S. Upper stock proportions had the greatest variability among stock groups, ranging from 0.365 (2001) to 0.554 (2003). The Upper stock predominated in all mixed stock fisheries except for the District 4 subsistence and District 5 commercial harvests. The 2006 Upper stock harvest, in numbers of fish, was greater than the 5-year average (2001–2005) yet the proportion was slightly less (Tables 11–12; Figure 6).

The Middle stock harvest estimate was 28,756 fish (0.276) The largest Middle stock harvest was from the District 4 subsistence catch. The 2006 Middle stock harvest, in both numbers of fish and by proportion, was greater than the 5-year average (2001–2005) (Tables 11–12; Figure 6).

The Lower stock contributed an estimated 18,301 fish (0.176) in the 2006 total harvest. The majority of the Lower stock harvest was attributed to the District 1 and 2 commercial harvests. The 2006 Lower stock harvest, in numbers of fish, was more than the 5-year average (2001–2006) and the proportion was near this average (Tables 11 and 12; Figure 6).

# DISCUSSION

Templin et al. 2008 reports stock composition for the 2006 Yukon River Chinook salmon harvests, albeit in finer-scale reporting groups, by all ages combined and by major ages. Throughout their report, references are made to the harvest. However, harvest numbers were not applied to the stock composition estimates, all estimates were based on harvest samples. This report apportions the Yukon River Chinook salmon harvests by age and stock composition.

The sample objective of 400 Chinook salmon from each commercial harvest period provided adequate numbers of age-1.3 and age-1.4 fish for genetic analysis. Recommended sample goals were at least 190 aged fish per age group. In 2006, age-1.3 fish were present in above average proportions and consequently, sample sizes were larger than expected for this age; age-1.4 fish typically are more abundant in the lower river commercial harvests (Bales 2008). If age-1.3 fish were not present in such high proportions, genetic analysis would have been limited for this age.

Typical patterns observed in previous years were again present in 2006. A temporal trend was observed in the lower commercial fisheries where the Upper stock group proportion decreases through the season while the Lower stock group proportion increases. Both age-1.3 and age-1.4 fish exhibited this trend in the District 1 and 2 harvests, however period 5 from both districts was a deviation from the trend with the Upper stock group proportion increasing (Figures 3 and 4). The Middle stock group proportion also exhibited a decreasing temporal trend in 2006, yet this is not a consistent trend observed in every year.

In 2006, the Middle stock group proportion in Alaska was above average. Some increase in this proportion is expected because of a change in the method used to estimate stock proportions. The District 5 harvest stock composition in the Chinook salmon origins reports from 1981 through 2003 were assigned to the Upper stock group under the assumption that most of these fish were

bound for Canada. Recent radio-telemetry studies have shown that substantial numbers of Chinook salmon return to Alaskan tributaries flowing into the mainstem Yukon River in District 5 (Eiler et al. 2004). This area extends from the confluence with the Tanana River (rm 695) to the Canadian border (rm 1224) and the entire Porcupine River drainage. Contributions from these stocks, considered part of the Middle stock group in this report, are identified on a finer scale as 'Upper U.S. Yukon' by Templin et al. (2008) and are represented by genetic collections from three tributaries in the their baseline. Beginning in 2004, harvests downstream of Fort Yukon in District 5 were considered mixed stocks and stock composition was estimated from commercial and subsistence samples collected in these fisheries. In 2006, an estimated 4,136 fish were from the Middle stock group in these fisheries, which contributed to the above average overall proportion.

The Upper stock group does predominate from the District 5 harvests, however; the Middle stock group proportion has trended up from 2004 through 2006. In 2004, estimated proportions for the Middle stock group from the District 5 commercial harvest for age-1.3 fish, age-1.4 fish, and all ages combined were 0.137, 0.162, and 0.137; respectively (Templin et al 2006a). The remaining fish were almost all Upper stock group, not surprising given the upriver location of the harvest. In 2005, estimated proportions for the Middle stock group from the District 5 commercial harvest for age-1.3 fish, age-1.4 fish and all ages combined were 0.308, 0.154, and 0.223; respectively (Templin et al 2006b). In 2006, estimated proportions for the Middle stock group from the District 5 commercial harvest for age-1.3 fish, age-1.4 fish and all ages combined were 0.509, 0.332, and 0.454; respectively (Templin et al 2008 and Table 6). The Middle stock group proportion from all ages combined in the District 5 subsistence harvest was 0.284 (Table 6).

The relatively high proportion of the Middle stock group in 2006, from upriver locations in District 5, was unusual and unexpected. This underscores the need to gather more information from Chinook salmon that spawn in Upper Alaskan tributaries and suggests that previous assumptions about the origin of fish in District 5 harvests may be inaccurate. If Middle stock group estimates from 2004 through 2006 are a reliable proxy for years when all District 5 harvests were assigned to the Upper stock group, then Canadian-origin fish were overestimated during those years.

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# TABLES AND FIGURES

Table 1.–Yukon River Chinook salmon escapement age composition by tributary and weighted age composition by geographic area, 2006.

| Location | Sample Size | Age Group 1.1 | 1.2 | 1.3 | 2.2 | 1.4 | 2.3 | 1.5 | 2.4 | 1.6 | 2.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| E.F. Andreafsky R. | 454 | 0.000 | 0.170 | 0.549 | 0.000 | 0.281 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Anvik River | 169 | 0.000 | 0.107 | 0.479 | 0.000 | 0.414 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Gisasa River | 530 | 0.001 | 0.189 | 0.672 | 0.000 | 0.129 | 0.007 | 0.001 | 0.001 | 0.000 | 0.000 |
| Tozitna River | 69 | 0.000 | 0.131 | 0.826 | 0.000 | 0.044 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Lower River Weighted | | 0.000 | 0.163 | 0.579 | 0.000 | 0.255 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 |
| Chena River | 362 | 0.000 | 0.127 | 0.453 | 0.003 | 0.403 | 0.003 | 0.011 | 0.000 | 0.000 | 0.000 |
| Salcha River | 509 | 0.000 | 0.057 | 0.493 | 0.000 | 0.428 | 0.002 | 0.020 | 0.000 | 0.000 | 0.000 |
| Middle River Weighted | | 0.000 | 0.072 | 0.484 | 0.001 | 0.423 | 0.002 | 0.018 | 0.000 | 0.000 | 0.000 |
| Upper River (unadjusted) | 735 | 0.000 | 0.213 | 0.584 | 0.002 | 0.199 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 |
| Upper River (adjusted)[a] | | 0.000 | 0.013 | 0.479 | 0.001 | 0.496 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 |

[a] Adjusted age composition after gear-selectivity coefficients were applied to the combined Sheep Rock and White Rock fish wheel age composition to obtain a more accurate estimate of the border passage escapement age composition.

Table 2.–Yukon River Chinook salmon commercial, subsistence, and test fishery age composition by location, gear type, and sample size, 2006.

| Location | Gear [a] | Sample Size | Age Group (Proportion) 1.1 | 1.2 | 1.3 | 2.2 | 1.4 | 2.3 | 1.5 | 2.4 | 1.6 | 2.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| District 1 Commercial | UGN | 1,788 | 0.000 | 0.018 | 0.468 | 0.000 | 0.498 | 0.000 | 0.016 | 0.001 | 0.000 | 0.000 |
| District 1 Subsistence | GN | 142 | 0.000 | 0.049 | 0.542 | 0.000 | 0.387 | 0.000 | 0.021 | 0.000 | 0.000 | 0.000 |
| District 2 Commercial | UGN | 1,462 | 0.000 | 0.018 | 0.532 | 0.000 | 0.437 | 0.003 | 0.010 | 0.000 | 0.000 | 0.000 |
| Pilot Station Sonar Test Fishery | $\geq$ 5" VMG | 470 | 0.000 | 0.047 | 0.581 | 0.000 | 0.362 | 0.006 | 0.004 | 0.000 | 0.000 | 0.000 |
| Marshall Test Fishery | 8.25" DGN | 309 | 0.000 | 0.003 | 0.522 | 0.000 | 0.472 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 |
| District 4 [b] Subsistence | GN | 324 | 0.000 | 0.077 | 0.500 | 0.000 | 0.407 | 0.000 | 0.012 | 0.003 | 0.000 | 0.000 |
| District 4 [c] Subsistence | SGN | 226 | 0.000 | 0.040 | 0.518 | 0.000 | 0.372 | 0.013 | 0.031 | 0.027 | 0.000 | 0.000 |
| District 4 Ruby | SGN/FW | 79 | 0.000 | 0.114 | 0.468 | 0.000 | 0.405 | 0.013 | 0.000 | 0.000 | 0.000 | 0.000 |
| District 5 Commercial | SGN/FW | 449 | 0.000 | 0.102 | 0.679 | 0.000 | 0.211 | 0.000 | 0.004 | 0.004 | 0.000 | 0.000 |
| Chena River Salcha River | Carcass | 871 | 0.000 | 0.072 | 0.484 | 0.001 | 0.423 | 0.002 | 0.018 | 0.000 | 0.000 | 0.000 |
| Canada Test Fishery | FW | 735 | 0.000 | 0.213 | 0.584 | 0.002 | 0.199 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 |

[a] UGN is unrestricted mesh gillnet, SGN is set gillnet, DGN is drift gillnet, VMG is variable mesh gillnet, GN is gillnet (includes both SGN and DGN), and FW is fish wheel.

[b] Samples were collected from the villages of Kaltag and Nulato.

[c] Samples were collected downstream of Galena from the Bishop Rock fish camp and from Galena.

Table 3.–Chinook salmon genetic samples collected and analyzed from commercial and subsistence fishery harvests in the Yukon River drainage, 2006.

| | | | | | Sample size | |
|---|---|---|---|---|---|---|
| Harvest | District | Period | Date | Location | Collected | Analyzed [a] |
| Commercial | | | | | | |
| | Y1 | 1 | June 19–20 | Emmonak | 400 | 371 |
| | | 2 | June 25–26 | Emmonak | 400 | 371 |
| | | 3 | June 29–30 | Emmonak | 400 | 384 |
| | | 4 | July 3–4 | Emmonak | 398 | 374 |
| | | 5 | July 6 | Emmonak | 241 | 226 |
| | Y2 | 1 | June 15 | Saint Mary's | 293 | 287 |
| | | 3 | June 24 | Saint Mary's | 400 | 383 |
| | | 4 | June 27 | Saint Mary's | 400 | 382 |
| | | 5 | July 2 | Saint Mary's | 400 | 364 |
| | Y3 | 1 | June 21 | Marshall | 107 | 106 |
| | Y5 | 1-4 | July 8–13 | Subdistricts 5-B, 5-C | 500 | 379 |
| | | | | Total Commercial | 3,939 | 3,627 |
| Subsistence | | | | | | |
| | Y1 | | June 7–23 | Emmonak | 139 | 130 |
| | Y4 | | June 27–July 11 | Kaltag/ Nulato/ Galena [b] | 420 | 259 |
| | | | July 5–15 | Bishop Rock | 200 | 162 |
| | | | July 7–15 | Ruby | 90 | 89 |
| | Y5 | | June 20–July 5 | Rampart-Rapids | 302 | 285 |
| | | | | Total Subsistence | 1,151 | 925 |
| | | | | Grand Total | 5,090 | 4,552 |

[a] Analyzed sample sizes were the number used to estimate stock composition to apportion Yukon River harvests.

[b] Samples collected from the village of Galena were not used.

Table 4.–Genetic stock composition estimates, by age and period, from Yukon River District 1 commercial harvest samples, 2006.

| | | Age-1.3 | | | Age-1.4 | | |
|---|---|---|---|---|---|---|---|
| Strata | Stock Group | Sample Size | Est. | 90% CI | Sample Size | Est. | 90% CI |
| Period 1 | Lower | 207 | 0.034 | (0.007–0.089) | 164 | 0.065 | (0.018–0.112) |
| June 19–20 | Middle | | 0.433 | (0.332–0.506) | | 0.388 | (0.305–0.486) |
| | Upper | | 0.533 | (0.458–0.623) | | 0.547 | (0.452–0.629) |
| Period 2 | Lower | 168 | 0.306 | (0.231–0.375) | 203 | 0.353 | (0.285–0.427) |
| June 25–26 | Middle | | 0.190 | (0.126–0.280) | | 0.145 | (0.086–0.209) |
| | Upper | | 0.504 | (0.409–0.581) | | 0.502 | (0.429–0.568) |
| Period 3 | Lower | 189 | 0.413 | (0.344–0.493) | 195 | 0.460 | (0.377–0.519) |
| June 29–30 | Middle | | 0.171 | (0.100–0.241) | | 0.097 | (0.050–0.172) |
| | Upper | | 0.417 | (0.338–0.495) | | 0.443 | (0.373–0.513) |
| Period 4 | Lower | 165 | 0.616 | (0.553–0.693) | 209 | 0.518 | (0.441–0.579) |
| July 3–4 | Middle | | 0.082 | (0.027–0.122) | | 0.093 | (0.042–0.155) |
| | Upper | | 0.302 | (0.238–0.371) | | 0.389 | (0.323–0.463) |
| Period 5 | Lower | 100 | 0.442 | (0.347–0.540) | 126 | 0.308 | (0.222–0.388) |
| July 6 | Middle | | 0.114 | (0.036–0.193) | | 0.085 | (0.043–0.151) |
| | Upper | | 0.443 | (0.356–0.538) | | 0.608 | (0.516–0.684) |

*Note*: All commercial fishing periods in District 1 were unrestricted mesh sizes.

Table 5.–Genetic stock composition estimates, by age and period, from Yukon River District 2 commercial harvest samples, 2006.

| | | Age-1.3 | | | Age-1.4 | | |
|---|---|---|---|---|---|---|---|
| Strata | Stock Group | Sample Size | Est. | 90% CI | Sample Size | Est. | 90% CI |
| Period 1 | Lower | 180 | 0.018 | (0.000–0.053) | 107 | 0.037 | (0.000–0.090) |
| June 15 | Middle | | 0.441 | (0.345–0.537) | | 0.286 | (0.201–0.400) |
| | Upper | | 0.541 | (0.442–0.628) | | 0.677 | (0.563–0.748) |
| Period 3 | Lower | 209 | 0.114 | (0.065–0.167) | 174 | 0.117 | (0.073–0.182) |
| June 24 | Middle | | 0.408 | (0.310–0.476) | | 0.314 | (0.237–0.386) |
| | Upper | | 0.479 | (0.415–0.571) | | 0.570 | (0.494–0.636) |
| Period 4 | Lower | 220 | 0.380 | (0.312–0.451) | 162 | 0.422 | (0.338–0.491) |
| June 27 | Middle | | 0.253 | (0.183–0.322) | | 0.240 | (0.168–0.327) |
| | Upper | | 0.367 | (0.301–0.434) | | 0.339 | (0.268–0.416) |
| Period 5 | Lower | 175 | 0.472 | (0.413–0.560) | 189 | 0.445 | (0.371–0.514) |
| July 2 | Middle | | 0.117 | (0.059–0.171) | | 0.099 | (0.055–0.157) |
| | Upper | | 0.411 | (0.332–0.476) | | 0.457 | (0.388–0.530) |

*Note*: All commercial fishing periods in District 2 were unrestricted mesh sizes except for period 2.

Table 6.–Genetic stock composition estimates, by age or all ages combined, from Yukon River Districts 1, 4, and 5 subsistence harvest samples; and Districts 3 and 5 commercial harvest samples, 2006.

| | | Age-1.3 | | | Age-1.4 | | |
|---|---|---|---|---|---|---|---|
| Strata | Stock Group | Sample Size | Est. | 90% CI | Sample Size | Est. | 90% CI |
| District 1 | Lower | 75 | 0.159 | (0.084–0.244) | 55 | 0.275 | (0.130–0.387) |
| Subsistence | Middle | | 0.378 | (0.248–0.491) | | 0.279 | (0.176–0.455) |
| | Upper | | 0.464 | (0.352–0.583) | | 0.446 | (0.310–0.564) |
| District 4[a] | Lower | 149 | 0.068 | (0.022–0.122) | 110 | 0.066 | (0.015–0.139) |
| Subsistence | Middle | | 0.373 | (0.269–0.470) | | 0.491 | (0.380–0.604) |
| Ktg/Nul | Upper | | 0.560 | (0.457–0.657) | | 0.443 | (0.335–0.539) |
| District 4[b] | Lower | 90 | 0.151 | (0.069–0.237) | 72 | 0.012 | (0.000–0.112) |
| Subsistence | Middle | | 0.463 | (0.326–0.567) | | 0.428 | (0.291–0.532) |
| Br | Upper | | 0.386 | (0.289–0.517) | | 0.560 | (0.431–0.672) |
| District 5 | Lower | 289 | 0.028 | (0.007–0.058) | 90 | 0.001 | (0.000–0.058) |
| Commercial | Middle | | 0.509 | (0.415–0.570) | | 0.332 | (0.168–0.407) |
| | Upper | | 0.463 | (0.401–0.553) | | 0.667 | (0.578–0.813) |

| | | All Ages Combined | | |
|---|---|---|---|---|
| Strata | Stock Group | Sample Size | Est. | 90% CI |
| District 3 | Lower | 106 | 0.067 | (0.018–0.129) |
| Commercial | Middle | | 0.390 | (0.268–0.524) |
| | Upper | | 0.543 | (0.414–0.664) |
| District 4[c] | Lower | 89 | 0.174 | (0.095–0.279) |
| Subsistence | Middle | | 0.781 | (0.663–0.868) |
| Ruby | Upper | | 0.044 | (0.001–0.113) |
| District 5 | Lower | 285 | 0.011 | (0.000–0.032) |
| Subsistence | Middle | | 0.284 | (0.213–0.352) |
| | Upper | | 0.705 | (0.635–0.777) |

[a] Samples were collected from Kaltag and Nulato, in Subdistrict 4-A.

[b] Samples were collected from Bishop Rock (Subdistricts 4-B and 4-C).

[c] Samples were collected from Ruby in Subdistricts 4-B and 4-C.

Table 7.–Yukon River Chinook salmon District 1 commercial harvest by age group, stock group, and period, 2006.

| Strata | Stock Group | Age Group 1.1 | 1.2 | 1.3 | 2.2 | 1.4 | 2.3 | 1.5 | 2.4 | 1.6 | 2.5 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Period 1 | Lower | 0 | 8 | 87 | 0 | 133 | 0 | 0 | 0 | 0 | 0 | 228 |
| June 19-20 | Middle | 0 | 53 | 1,099 | 0 | 792 | 0 | 43 | 0 | 0 | 0 | 1,986 |
| | Alaska | 0 | 61 | 1,186 | 0 | 924 | 0 | 43 | 0 | 0 | 0 | 2,215 |
| | Upper | 0 | 12 | 1,354 | 0 | 1,115 | 0 | 30 | 0 | 0 | 0 | 2,511 |
| | Total | 0 | 73 | 2,540 | 0 | 2,039 | 0 | 73 | 0 | 0 | 0 | 4,726 |
| Period 2 | Lower | 0 | 137 | 953 | 0 | 1,325 | 0 | 4 | 0 | 0 | 0 | 2,420 |
| June 25-26 | Middle | 0 | 45 | 594 | 0 | 543 | 0 | 52 | 0 | 0 | 0 | 1,234 |
| | Alaska | 0 | 183 | 1,547 | 0 | 1,868 | 0 | 56 | 0 | 0 | 0 | 3,654 |
| | Upper | 0 | 21 | 1,571 | 0 | 1,881 | 0 | 92 | 0 | 0 | 0 | 3,565 |
| | Total | 0 | 204 | 3,118 | 0 | 3,749 | 0 | 148 | 0 | 0 | 0 | 7,219 |
| Period 3 | Lower | 0 | 74 | 1,511 | 0 | 1,747 | 0 | 3 | 19 | 0 | 0 | 3,354 |
| June 29-30 | Middle | 0 | 16 | 625 | 0 | 367 | 0 | 23 | 0 | 0 | 0 | 1,031 |
| | Alaska | 0 | 90 | 2,136 | 0 | 2,114 | 0 | 26 | 19 | 0 | 0 | 4,385 |
| | Upper | 0 | 7 | 1,526 | 0 | 1,684 | 0 | 52 | 0 | 0 | 0 | 3,269 |
| | Total | 0 | 97 | 3,662 | 0 | 3,798 | 0 | 78 | 19 | 0 | 0 | 7,654 |
| Period 4 | Lower | 0 | 36 | 818 | 0 | 871 | 0 | 3 | 0 | 0 | 0 | 1,727 |
| July 3-4 | Middle | 0 | 3 | 109 | 0 | 156 | 0 | 15 | 0 | 0 | 0 | 282 |
| | Alaska | 0 | 38 | 927 | 0 | 1,027 | 0 | 17 | 0 | 0 | 0 | 2,009 |
| | Upper | 0 | 2 | 401 | 0 | 653 | 0 | 31 | 0 | 0 | 0 | 1,087 |
| | Total | 0 | 40 | 1,328 | 0 | 1,680 | 0 | 48 | 0 | 0 | 0 | 3,096 |
| Period 5 | Lower | 0 | 11 | 199 | 0 | 167 | 3 | 1 | 0 | 0 | 0 | 381 |
| July 6 | Middle | 0 | 1 | 51 | 0 | 46 | 1 | 5 | 0 | 0 | 0 | 104 |
| | Alaska | 0 | 12 | 250 | 0 | 214 | 4 | 5 | 0 | 0 | 0 | 485 |
| | Upper | 0 | 1 | 199 | 0 | 331 | 0 | 17 | 0 | 0 | 0 | 548 |
| | Total | 0 | 13 | 450 | 0 | 544 | 4 | 22 | 0 | 0 | 0 | 1,033 |
| All Periods | Lower | 0 | 275 | 3,692 | 0 | 4,388 | 3 | 11 | 20 | 0 | 0 | 8,389 |
| Combined [a] | Middle | 0 | 123 | 2,563 | 0 | 1,970 | 1 | 141 | 0 | 0 | 0 | 4,797 |
| | Alaska | 0 | 398 | 6,254 | 0 | 6,358 | 4 | 153 | 20 | 0 | 0 | 13,186 |
| | Upper | 0 | 44 | 5,226 | 0 | 5,859 | 0 | 229 | 0 | 0 | 0 | 11,359 |
| | Total | 0 | 442 | 11,480 | 0 | 12,217 | 4 | 382 | 20 | 0 | 0 | 24,545 |

*Note*: All District 1 Chinook salmon commercial fishing periods were unrestricted mesh sizes.

[a] Includes 817 fish sold from the lower Yukon River test fisheries.

Table 8.–Yukon River Chinook salmon District 2 commercial harvest by age group, stock group, and period, 2006.

| Strata | Stock Group | Age Group 1.1 | 1.2 | 1.3 | 2.2 | 1.4 | 2.3 | 1.5 | 2.4 | 1.6 | 2.5 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Period 1 | Lower | 0 | 0 | 10 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 23 |
| June 15 | Middle | 0 | 2 | 254 | 0 | 95 | 3 | 1 | 0 | 0 | 0 | 355 |
| | Alaska | 0 | 2 | 264 | 0 | 108 | 3 | 1 | 0 | 0 | 0 | 379 |
| | Upper | 0 | 1 | 311 | 0 | 226 | 0 | 2 | 0 | 0 | 0 | 538 |
| | Total | 0 | 3 | 575 | 0 | 333 | 3 | 3 | 0 | 0 | 0 | 917 |
| Period 2 | Lower | 0 | 4 | 29 | 0 | 24 | 1 | 0 | 0 | 0 | 0 | 58 |
| June 22 | Middle | 0 | 3 | 105 | 0 | 64 | 2 | 3 | 0 | 0 | 0 | 176 |
| | Alaska | 0 | 6 | 134 | 0 | 88 | 2 | 3 | 0 | 0 | 0 | 234 |
| | Upper | 0 | 1 | 123 | 0 | 116 | 0 | 4 | 0 | 0 | 0 | 244 |
| | Total | 0 | 7 | 257 | 0 | 204 | 2 | 7 | 0 | 0 | 0 | 478 |
| Period 3 | Lower | 0 | 48 | 361 | 0 | 295 | 10 | 1 | 0 | 0 | 0 | 715 |
| June 24 | Middle | 0 | 32 | 1,295 | 0 | 791 | 20 | 41 | 0 | 0 | 0 | 2,180 |
| | Alaska | 0 | 80 | 1,656 | 0 | 1,086 | 30 | 42 | 0 | 0 | 0 | 2,895 |
| | Upper | 0 | 11 | 1,520 | 0 | 1,437 | 0 | 49 | 0 | 0 | 0 | 3,016 |
| | Total | 0 | 91 | 3,177 | 0 | 2,522 | 30 | 91 | 0 | 0 | 0 | 5,911 |
| Period 4 | Lower | 0 | 114 | 1,527 | 0 | 1,212 | 12 | 0 | 0 | 0 | 0 | 2,865 |
| June 27 | Middle | 0 | 40 | 1,016 | 0 | 688 | 6 | 41 | 0 | 0 | 0 | 1,791 |
| | Alaska | 0 | 154 | 2,543 | 0 | 1,900 | 18 | 42 | 0 | 0 | 0 | 4,656 |
| | Upper | 0 | 10 | 1,474 | 0 | 972 | 0 | 31 | 0 | 0 | 0 | 2,488 |
| | Total | 0 | 164 | 4,017 | 0 | 2,872 | 18 | 73 | 0 | 0 | 0 | 7,144 |
| Period 5 | Lower | 0 | 58 | 863 | 0 | 883 | 0 | 0 | 0 | 0 | 0 | 1,803 |
| July 2 | Middle | 0 | 8 | 214 | 0 | 196 | 0 | 10 | 0 | 0 | 0 | 427 |
| | Alaska | 0 | 65 | 1,076 | 0 | 1,079 | 0 | 10 | 0 | 0 | 0 | 2,231 |
| | Upper | 0 | 5 | 751 | 0 | 907 | 0 | 10 | 0 | 0 | 0 | 1,672 |
| | Total | 0 | 70 | 1,827 | 0 | 1,986 | 0 | 20 | 0 | 0 | 0 | 3,903 |
| Period 6 | Lower | 0 | 22 | 327 | 0 | 335 | 0 | 0 | 0 | 0 | 0 | 684 |
| July 6 | Middle | 0 | 3 | 81 | 0 | 74 | 0 | 4 | 0 | 0 | 0 | 162 |
| | Alaska | 0 | 25 | 408 | 0 | 409 | 0 | 4 | 0 | 0 | 0 | 846 |
| | Upper | 0 | 2 | 285 | 0 | 344 | 0 | 4 | 0 | 0 | 0 | 635 |
| | Total | 0 | 27 | 693 | 0 | 754 | 0 | 8 | 0 | 0 | 0 | 1,481 |
| All Periods | Lower | 0 | 245 | 3,118 | 0 | 2,761 | 23 | 2 | 0 | 0 | 0 | 6,149 |
| Combined | Middle | 0 | 88 | 2,963 | 0 | 1,908 | 30 | 102 | 0 | 0 | 0 | 5,091 |
| | Alaska | 0 | 333 | 6,081 | 0 | 4,670 | 53 | 103 | 0 | 0 | 0 | 11,240 |
| | Upper | 0 | 29 | 4,464 | 0 | 4,002 | 0 | 99 | 0 | 0 | 0 | 8,594 |
| | Total | 0 | 362 | 10,545 | 0 | 8,672 | 53 | 202 | 0 | 0 | 0 | 19,834 |

*Note*: All District 2 Chinook salmon commercial fishing periods were unrestricted mesh sizes, except for period 2 that was restricted mesh size.

Table 9.–Yukon River Chinook salmon total harvest by age group, stock group, and fishery, 2006.

| District | Fishery | Stock Group | Age Group 1.1 | 1.2 | 1.3 | 2.2 | 1.4 | 2.3 | 1.5 | 2.4 | 1.6 | 2.5 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Commercial | Lower | 0 | 275 | 3,692 | 0 | 4,388 | 3 | 11 | 20 | 0 | 0 | 8,389 |
| | | Middle | 0 | 123 | 2,563 | 0 | 1,970 | 1 | 141 | 0 | 0 | 0 | 4,797 |
| | | Alaska | 0 | 398 | 6,254 | 0 | 6,358 | 4 | 153 | 20 | 0 | 0 | 13,186 |
| | | Upper | 0 | 44 | 5,226 | 0 | 5,859 | 0 | 229 | 0 | 0 | 0 | 11,359 |
| | | Total | 0 | 442 | 11,480 | 0 | 12,217 | 4 | 382 | 20 | 0 | 0 | 24,545 |
| | Subsistence | Lower | 0 | 100 | 441 | 0 | 546 | 0 | 2 | 0 | 0 | 0 | 1,089 |
| | | Middle | 0 | 125 | 1,049 | 0 | 553 | 0 | 59 | 0 | 0 | 0 | 1,787 |
| | | Alaska | 0 | 225 | 1,490 | 0 | 1,099 | 0 | 61 | 0 | 0 | 0 | 2,875 |
| | | Upper | 0 | 27 | 1,287 | 0 | 885 | 0 | 47 | 0 | 0 | 0 | 2,247 |
| | | Total | 0 | 252 | 2,777 | 0 | 1,984 | 0 | 108 | 0 | 0 | 0 | 5,122 |
| 2 | Commercial | Lower | 0 | 245 | 3,118 | 0 | 2,761 | 23 | 2 | 0 | 0 | 0 | 6,149 |
| | | Middle | 0 | 88 | 2,963 | 0 | 1,908 | 30 | 102 | 0 | 0 | 0 | 5,091 |
| | | Alaska | 0 | 333 | 6,081 | 0 | 4,670 | 53 | 103 | 0 | 0 | 0 | 11,240 |
| | | Upper | 0 | 29 | 4,464 | 0 | 4,002 | 0 | 99 | 0 | 0 | 0 | 8,594 |
| | | Total | 0 | 362 | 10,545 | 0 | 8,672 | 53 | 202 | 0 | 0 | 0 | 19,834 |
| | Subsistence | Lower | 0 | 62 | 446 | 0 | 442 | 11 | 1 | 0 | 0 | 0 | 962 |
| | | Middle | 0 | 139 | 1,879 | 0 | 906 | 18 | 45 | 0 | 0 | 0 | 2,987 |
| | | Alaska | 0 | 201 | 2,325 | 0 | 1,348 | 30 | 45 | 0 | 0 | 0 | 3,949 |
| | | Upper | 0 | 30 | 2,272 | 0 | 1,745 | 0 | 43 | 0 | 0 | 0 | 4,090 |
| | | Total | 0 | 231 | 4,597 | 0 | 3,094 | 30 | 89 | 0 | 0 | 0 | 8,039 |
| 3 | Commercial | Lower | 0 | 0 | 11 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 21 |
| | | Middle | 0 | 2 | 65 | 0 | 51 | 1 | 2 | 1 | 0 | 0 | 123 |
| | | Alaska | 0 | 3 | 76 | 0 | 60 | 1 | 3 | 1 | 0 | 0 | 144 |
| | | Upper | 0 | 3 | 90 | 0 | 71 | 2 | 3 | 2 | 0 | 0 | 171 |
| | | Total | 0 | 6 | 166 | 0 | 131 | 3 | 6 | 3 | 0 | 0 | 315 |
| | Subsistence | Lower | 0 | 32 | 185 | 0 | 167 | 6 | 0 | 17 | 0 | 0 | 408 |
| | | Middle | 0 | 105 | 1,155 | 0 | 750 | 22 | 51 | 0 | 0 | 0 | 2,083 |
| | | Alaska | 0 | 137 | 1,340 | 0 | 917 | 29 | 51 | 17 | 0 | 0 | 2,491 |
| | | Upper | 0 | 24 | 1,457 | 0 | 1,356 | 0 | 46 | 0 | 0 | 0 | 2,883 |
| | | Total | 0 | 161 | 2,797 | 0 | 2,273 | 29 | 97 | 17 | 0 | 0 | 5,374 |
| 4 | Subsistence | Lower | 0 | 190 | 553 | 0 | 258 | 13 | 0 | 111 | 0 | 0 | 1,125 |
| | | Middle | 0 | 547 | 2,615 | 0 | 2,285 | 35 | 130 | 0 | 0 | 0 | 5,612 |
| | | Alaska | 0 | 737 | 3,167 | 0 | 2,543 | 49 | 130 | 111 | 0 | 0 | 6,737 |
| | | Upper | 0 | 116 | 2,942 | 0 | 2,155 | 0 | 71 | 0 | 0 | 0 | 5,284 |
| | | Total | 0 | 853 | 6,110 | 0 | 4,698 | 49 | 201 | 111 | 0 | 0 | 12,022 |
| 5 | Commercial | Lower | 0 | 16 | 35 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 58 |
| | | Middle | 0 | 149 | 636 | 0 | 129 | 0 | 4 | 0 | 0 | 0 | 917 |
| | | Alaska | 0 | 164 | 671 | 0 | 129 | 0 | 4 | 7 | 0 | 0 | 975 |
| | | Upper | 0 | 24 | 578 | 0 | 258 | 0 | 4 | 0 | 0 | 0 | 864 |
| | | Total | 0 | 188 | 1,249 | 0 | 387 | 0 | 8 | 7 | 0 | 0 | 1,839 |
| | Subsistence | Lower | 0 | 10 | 68 | 0 | 21 | 0 | 0 | 0 | 0 | 0 | 101 |
| | | Middle | 0 | 329 | 2,186 | 0 | 678 | 0 | 14 | 12 | 0 | 0 | 3,219 |
| | | Alaska | 0 | 340 | 2,254 | 0 | 699 | 0 | 14 | 13 | 0 | 0 | 3,320 |
| | | Upper | 0 | 1,289 | 8,558 | 0 | 2,654 | 0 | 55 | 48 | 0 | 0 | 12,604 |
| | | Total | 0 | 1,629 | 10,812 | 0 | 3,353 | 0 | 69 | 61 | 0 | 0 | 15,924 |

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Table 9.–Page 2 of 2.

| District | Fishery | Stock Group | Age Group 1.1 | 1.2 | 1.3 | 2.2 | 1.4 | 2.3 | 1.5 | 2.4 | 1.6 | 2.5 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | Commercial | Middle | 0 | 6 | 41 | 0 | 36 | 0 | 1 | 0 | 0 | 0 | 84 |
| | Subsistence | Middle | 0 | 95 | 639 | 1 | 557 | 3 | 23 | 0 | 0 | 0 | 1,318 |
| | Sport Fish | Middle | 0 | 53 | 358 | 0 | 313 | 2 | 13 | 0 | 0 | 0 | 739 |
| | | Total | 0 | 154 | 1,037 | 0 | 905 | 5 | 38 | 0 | 0 | 0 | 2,140 |
| Canada | Commercial | Upper | 0 | 30 | 1,118 | 3 | 1,156 | 0 | 25 | 0 | 0 | 0 | 2,332 |
| | Aboriginal | Upper | 0 | 77 | 2,911 | 9 | 3,010 | 0 | 64 | 0 | 0 | 0 | 6,071 |
| | Domestic | Upper | 0 | 1 | 30 | 0 | 31 | 0 | 1 | 0 | 0 | 0 | 63 |
| | Sport Fish | Upper | 0 | 8 | 291 | 1 | 300 | 0 | 6 | 0 | 0 | 0 | 606 |
| | | Total | 0 | 115 | 4,350 | 13 | 4,498 | 0 | 95 | 0 | 0 | 0 | 9,072 |
| Total Harvest | | Lower | 0 | 929 | 8,549 | 0 | 8,593 | 58 | 17 | 155 | 0 | 0 | 18,301 |
| | | Middle | 0 | 1,762 | 16,148 | 0 | 10,135 | 113 | 585 | 14 | 0 | 0 | 28,756 |
| | | Alaska | 0 | 2,691 | 24,696 | 0 | 18,728 | 170 | 602 | 169 | 0 | 0 | 47,057 |
| | | Upper | 0 | 1,702 | 31,224 | 13 | 23,484 | 2 | 694 | 50 | 0 | 0 | 57,169 |
| | | Total | 0 | 4,393 | 55,920 | 13 | 42,213 | 172 | 1,296 | 218 | 0 | 0 | 104,225 |

Table 10.–Yukon River Chinook salmon total harvest proportion by age group, stock group, and fishery, 2006.

| District | Fishery | Stock Group | Age Group 1.1 | 1.2 | 1.3 | 2.2 | 1.4 | 2.3 | 1.5 | 2.4 | 1.6 | 2.5 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Commercial | Lower | 0.000 | 0.011 | 0.150 | 0.000 | 0.179 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.342 |
| | | Middle | 0.000 | 0.005 | 0.104 | 0.000 | 0.080 | 0.000 | 0.006 | 0.000 | 0.000 | 0.000 | 0.195 |
| | | Alaska | 0.000 | 0.016 | 0.255 | 0.000 | 0.259 | 0.000 | 0.006 | 0.001 | 0.000 | 0.000 | 0.537 |
| | | Upper | 0.000 | 0.002 | 0.213 | 0.000 | 0.239 | 0.000 | 0.009 | 0.000 | 0.000 | 0.000 | 0.463 |
| | | Total | 0.000 | 0.018 | 0.468 | 0.000 | 0.498 | 0.000 | 0.016 | 0.001 | 0.000 | 0.000 | 1.000 |
| | Subsistence | Lower | 0.000 | 0.019 | 0.086 | 0.000 | 0.107 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.213 |
| | | Middle | 0.000 | 0.024 | 0.205 | 0.000 | 0.108 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 | 0.349 |
| | | Alaska | 0.000 | 0.044 | 0.291 | 0.000 | 0.215 | 0.000 | 0.012 | 0.000 | 0.000 | 0.000 | 0.561 |
| | | Upper | 0.000 | 0.005 | 0.251 | 0.000 | 0.173 | 0.000 | 0.009 | 0.000 | 0.000 | 0.000 | 0.439 |
| | | Total | 0.000 | 0.049 | 0.542 | 0.000 | 0.387 | 0.000 | 0.021 | 0.000 | 0.000 | 0.000 | 1.000 |
| 2 | Commercial | Lower | 0.000 | 0.012 | 0.157 | 0.000 | 0.139 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.310 |
| | | Middle | 0.000 | 0.004 | 0.149 | 0.000 | 0.096 | 0.002 | 0.005 | 0.000 | 0.000 | 0.000 | 0.257 |
| | | Alaska | 0.000 | 0.017 | 0.307 | 0.000 | 0.235 | 0.003 | 0.005 | 0.000 | 0.000 | 0.000 | 0.567 |
| | | Upper | 0.000 | 0.001 | 0.225 | 0.000 | 0.202 | 0.000 | 0.005 | 0.000 | 0.000 | 0.000 | 0.433 |
| | | Total | 0.000 | 0.018 | 0.532 | 0.000 | 0.437 | 0.003 | 0.010 | 0.000 | 0.000 | 0.000 | 1.000 |
| | Subsistence | Lower | 0.000 | 0.008 | 0.055 | 0.000 | 0.055 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.120 |
| | | Middle | 0.000 | 0.017 | 0.234 | 0.000 | 0.113 | 0.002 | 0.006 | 0.000 | 0.000 | 0.000 | 0.372 |
| | | Alaska | 0.000 | 0.025 | 0.289 | 0.000 | 0.168 | 0.004 | 0.006 | 0.000 | 0.000 | 0.000 | 0.491 |
| | | Upper | 0.000 | 0.004 | 0.283 | 0.000 | 0.217 | 0.000 | 0.005 | 0.000 | 0.000 | 0.000 | 0.509 |
| | | Total | 0.000 | 0.029 | 0.572 | 0.000 | 0.385 | 0.004 | 0.011 | 0.000 | 0.000 | 0.000 | 1.000 |
| 3 | Commercial | Lower | 0.000 | 0.001 | 0.035 | 0.000 | 0.028 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.067 |
| | | Middle | 0.000 | 0.007 | 0.205 | 0.000 | 0.163 | 0.004 | 0.007 | 0.004 | 0.000 | 0.000 | 0.390 |
| | | Alaska | 0.000 | 0.009 | 0.240 | 0.000 | 0.190 | 0.004 | 0.009 | 0.004 | 0.000 | 0.000 | 0.457 |
| | | Upper | 0.000 | 0.010 | 0.286 | 0.000 | 0.227 | 0.005 | 0.010 | 0.005 | 0.000 | 0.000 | 0.543 |
| | | Total | 0.000 | 0.019 | 0.525 | 0.000 | 0.417 | 0.010 | 0.019 | 0.010 | 0.000 | 0.000 | 1.000 |
| | Subsistence | Lower | 0.000 | 0.006 | 0.034 | 0.000 | 0.031 | 0.001 | 0.000 | 0.003 | 0.000 | 0.000 | 0.076 |
| | | Middle | 0.000 | 0.020 | 0.215 | 0.000 | 0.140 | 0.004 | 0.009 | 0.000 | 0.000 | 0.000 | 0.388 |
| | | Alaska | 0.000 | 0.026 | 0.249 | 0.000 | 0.171 | 0.005 | 0.010 | 0.003 | 0.000 | 0.000 | 0.464 |
| | | Upper | 0.000 | 0.004 | 0.271 | 0.000 | 0.252 | 0.000 | 0.009 | 0.000 | 0.000 | 0.000 | 0.536 |
| | | Total | 0.000 | 0.030 | 0.520 | 0.000 | 0.423 | 0.005 | 0.018 | 0.003 | 0.000 | 0.000 | 1.000 |
| 4 | Subsistence | Lower | 0.000 | 0.016 | 0.046 | 0.000 | 0.021 | 0.001 | 0.000 | 0.009 | 0.000 | 0.000 | 0.094 |
| | | Middle | 0.000 | 0.046 | 0.217 | 0.000 | 0.190 | 0.003 | 0.011 | 0.000 | 0.000 | 0.000 | 0.467 |
| | | Alaska | 0.000 | 0.061 | 0.263 | 0.000 | 0.212 | 0.004 | 0.011 | 0.009 | 0.000 | 0.000 | 0.560 |
| | | Upper | 0.000 | 0.010 | 0.245 | 0.000 | 0.179 | 0.000 | 0.006 | 0.000 | 0.000 | 0.000 | 0.440 |
| | | Total | 0.000 | 0.071 | 0.508 | 0.000 | 0.391 | 0.004 | 0.017 | 0.009 | 0.000 | 0.000 | 1.000 |
| 5 | Commercial | Lower | 0.000 | 0.008 | 0.019 | 0.000 | 0.000 | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.031 |
| | | Middle | 0.000 | 0.081 | 0.346 | 0.000 | 0.070 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.499 |
| | | Alaska | 0.000 | 0.089 | 0.365 | 0.000 | 0.070 | 0.000 | 0.002 | 0.004 | 0.000 | 0.000 | 0.530 |
| | | Upper | 0.000 | 0.013 | 0.314 | 0.000 | 0.140 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.470 |
| | | Total | 0.000 | 0.102 | 0.679 | 0.000 | 0.211 | 0.000 | 0.004 | 0.004 | 0.000 | 0.000 | 1.000 |
| | Subsistence | Lower | 0.000 | 0.001 | 0.004 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.006 |
| | | Middle | 0.000 | 0.021 | 0.137 | 0.000 | 0.043 | 0.000 | 0.001 | 0.001 | 0.000 | 0.000 | 0.202 |
| | | Alaska | 0.000 | 0.021 | 0.142 | 0.000 | 0.044 | 0.000 | 0.001 | 0.001 | 0.000 | 0.000 | 0.208 |
| | | Upper | 0.000 | 0.081 | 0.537 | 0.000 | 0.167 | 0.000 | 0.003 | 0.003 | 0.000 | 0.000 | 0.792 |
| | | Total | 0.000 | 0.102 | 0.679 | 0.000 | 0.211 | 0.000 | 0.004 | 0.004 | 0.000 | 0.000 | 1.000 |

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Table 10.–Page 2 of 2.

| District | Fishery | Stock Group | Age Group 1.1 | 1.2 | 1.3 | 2.2 | 1.4 | 2.3 | 1.5 | 2.4 | 1.6 | 2.5 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | Commercial | Middle | 0.000 | 0.003 | 0.019 | 0.000 | 0.017 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.039 |
| | Subsistence | Middle | 0.000 | 0.044 | 0.298 | 0.000 | 0.260 | 0.001 | 0.011 | 0.000 | 0.000 | 0.000 | 0.616 |
| | Sport Fish | Middle | 0.000 | 0.025 | 0.167 | 0.000 | 0.146 | 0.001 | 0.006 | 0.000 | 0.000 | 0.000 | 0.345 |
| | | Total | 0.000 | 0.072 | 0.485 | 0.000 | 0.423 | 0.002 | 0.018 | 0.000 | 0.000 | 0.000 | 1.000 |
| Canada | Commercial | Upper | 0.000 | 0.003 | 0.123 | 0.000 | 0.127 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.257 |
| | Aboriginal | Upper | 0.000 | 0.009 | 0.321 | 0.001 | 0.332 | 0.000 | 0.007 | 0.000 | 0.000 | 0.000 | 0.669 |
| | Domestic | Upper | 0.000 | 0.000 | 0.003 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.007 |
| | Sport Fish | Upper | 0.000 | 0.001 | 0.032 | 0.000 | 0.033 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.067 |
| | | Total | 0.000 | 0.013 | 0.479 | 0.001 | 0.496 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 | 1.000 |
| Total Harvest | | Lower | 0.000 | 0.009 | 0.082 | 0.000 | 0.082 | 0.001 | 0.000 | 0.001 | 0.000 | 0.000 | 0.176 |
| | | Middle | 0.000 | 0.017 | 0.155 | 0.000 | 0.097 | 0.001 | 0.006 | 0.000 | 0.000 | 0.000 | 0.276 |
| | | Alaska | 0.000 | 0.026 | 0.237 | 0.000 | 0.180 | 0.002 | 0.006 | 0.002 | 0.000 | 0.000 | 0.451 |
| | | Upper | 0.000 | 0.016 | 0.300 | 0.000 | 0.225 | 0.000 | 0.007 | 0.000 | 0.000 | 0.000 | 0.549 |
| | | Total | 0.000 | 0.042 | 0.537 | 0.000 | 0.405 | 0.002 | 0.012 | 0.002 | 0.000 | 0.000 | 1.000 |

Table 11.–Yukon River Chinook salmon harvest by stock group for the United States and Canada, 1981–2006.

| Year | Lower | Middle | Upper | | | U.S. Total | Total |
|---|---|---|---|---|---|---|---|
| | | | U.S. | Canada | Total | | |
| 1981 | 11,164 | 112,669 | 64,644 | 18,109 | 82,753 | 188,477 | 206,586 |
| 1982 | 23,601 | 41,967 | 87,241 | 17,208 | 104,449 | 152,809 | 170,017 |
| 1983 | 28,081 | 73,361 | 96,994 | 18,952 | 115,946 | 198,436 | 217,388 |
| 1984 | 45,210 | 71,656 | 44,735 | 16,795 | 61,530 | 161,601 | 178,396 |
| 1985 | 57,770 | 46,753 | 85,773 | 19,301 | 105,074 | 190,296 | 209,597 |
| 1986 | 32,517 | 15,894 | 97,593 | 20,364 | 117,957 | 146,004 | 166,368 |
| 1987 | 32,847 | 40,281 | 115,258 | 17,614 | 132,872 | 188,386 | 206,000 |
| 1988 | 36,967 | 26,805 | 84,649 | 21,427 | 106,076 | 148,421 | 169,848 |
| 1989 | 42,872 | 27,936 | 86,798 | 17,944 | 104,742 | 157,606 | 175,550 |
| 1990 | 34,007 | 42,430 | 72,996 | 19,227 | 92,223 | 149,433 | 168,660 |
| 1991 | 49,113 | 44,328 | 61,210 | 20,607 | 81,817 | 154,651 | 175,258 |
| 1992 | 30,330 | 40,600 | 97,261 | 17,903 | 115,164 | 168,191 | 186,094 |
| 1993 | 38,592 | 45,671 | 78,815 | 16,611 | 95,426 | 163,078 | 179,689 |
| 1994 | 35,161 | 41,488 | 95,666 | 21,218 | 116,884 | 172,315 | 193,533 |
| 1995 | 35,518 | 44,404 | 97,741 | 20,887 | 118,628 | 177,663 | 198,550 |
| 1996 | 33,278 | 16,386 | 88,958 | 19,612 | 108,570 | 138,622 | 158,234 |
| 1997 | 50,420 | 32,043 | 92,162 | 16,528 | 108,690 | 174,625 | 191,153 |
| 1998 | 34,759 | 18,509 | 46,947 | 5,937 | 52,884 | 100,215 | 106,152 |
| 1999 | 54,788 | 8,619 | 60,908 | 12,468 | 73,376 | 124,315 | 136,783 |
| 2000 | 16,989 | 6,176 | 22,143 | 4,879 | 27,022 | 45,308 | 50,187 |
| 2001 | 20,115 | 10,190 | 23,325 | 10,139 | 33,421 | 53,630 | 63,726 |
| 2002 | 14,895 | 22,395 | 30,058 | 9,257 | 39,387 | 67,348 | 76,677 |
| 2003 | 7,394 | 31,232 | 59,940 | 9,619 | 69,559 | 98,566 | 108,185 |
| 2004 | 18,965 | 35,553 | 57,831 | 11,238 | 69,069 | 112,349 | 123,587 |
| 2005 | 19,893 | 20,607 | 44,650 | 11,074 | 55,724 | 85,149 | 96,223 |
| 2006 | 18,301 | 28,756 | 48,097 | 9,072 | 57,169 | 95,153 | 104,225 |
| Average (1981-2005) | 32,210 | 36,718 | 71,772 | 15,797 | 87,570 | 140,700 | 156,498 |
| 5-Year Average (2001-2005) | 16,252 | 23,995 | 43,161 | 10,265 | 53,432 | 83,408 | 93,680 |

Table 12.–Yukon River Chinook salmon harvest proportion by stock group for the United States and Canada, 1981–2006.

| Year | Lower | Middle | Upper | | | U.S. Total | Total |
|---|---|---|---|---|---|---|---|
| | | | U.S. | Canada | Total | | |
| 1981 | 0.054 | 0.545 | 0.313 | 0.088 | 0.401 | 0.912 | 1.000 |
| 1982 | 0.139 | 0.247 | 0.513 | 0.101 | 0.614 | 0.899 | 1.000 |
| 1983 | 0.129 | 0.337 | 0.446 | 0.087 | 0.533 | 0.913 | 1.000 |
| 1984 | 0.253 | 0.402 | 0.251 | 0.094 | 0.345 | 0.906 | 1.000 |
| 1985 | 0.276 | 0.223 | 0.409 | 0.092 | 0.501 | 0.908 | 1.000 |
| 1986 | 0.195 | 0.096 | 0.587 | 0.122 | 0.709 | 0.878 | 1.000 |
| 1987 | 0.159 | 0.196 | 0.560 | 0.086 | 0.645 | 0.914 | 1.000 |
| 1988 | 0.218 | 0.158 | 0.498 | 0.126 | 0.625 | 0.874 | 1.000 |
| 1989 | 0.244 | 0.159 | 0.494 | 0.102 | 0.597 | 0.898 | 1.000 |
| 1990 | 0.202 | 0.252 | 0.433 | 0.114 | 0.547 | 0.886 | 1.000 |
| 1991 | 0.280 | 0.253 | 0.349 | 0.118 | 0.467 | 0.882 | 1.000 |
| 1992 | 0.163 | 0.218 | 0.523 | 0.096 | 0.619 | 0.904 | 1.000 |
| 1993 | 0.215 | 0.254 | 0.439 | 0.092 | 0.531 | 0.908 | 1.000 |
| 1994 | 0.182 | 0.214 | 0.494 | 0.110 | 0.604 | 0.890 | 1.000 |
| 1995 | 0.179 | 0.224 | 0.492 | 0.105 | 0.597 | 0.895 | 1.000 |
| 1996 | 0.210 | 0.104 | 0.562 | 0.124 | 0.686 | 0.876 | 1.000 |
| 1997 | 0.264 | 0.168 | 0.482 | 0.086 | 0.569 | 0.914 | 1.000 |
| 1998 | 0.327 | 0.174 | 0.442 | 0.056 | 0.498 | 0.944 | 1.000 |
| 1999 | 0.401 | 0.063 | 0.445 | 0.091 | 0.536 | 0.909 | 1.000 |
| 2000 | 0.339 | 0.123 | 0.441 | 0.097 | 0.538 | 0.903 | 1.000 |
| 2001 | 0.316 | 0.160 | 0.365 | 0.159 | 0.524 | 0.841 | 1.000 |
| 2002 | 0.194 | 0.292 | 0.393 | 0.121 | 0.514 | 0.879 | 1.000 |
| 2003 | 0.068 | 0.289 | 0.554 | 0.089 | 0.643 | 0.911 | 1.000 |
| 2004 | 0.153 | 0.288 | 0.468 | 0.091 | 0.559 | 0.909 | 1.000 |
| 2005 | 0.207 | 0.214 | 0.464 | 0.115 | 0.579 | 0.885 | 1.000 |
| 2006 | 0.176 | 0.276 | 0.461 | 0.087 | 0.549 | 0.913 | 1.000 |
| Average (1981-2005) | 0.206 | 0.235 | 0.459 | 0.101 | 0.560 | 0.899 | 1.000 |
| 5-Year Average (2001-2005) | 0.173 | 0.256 | 0.461 | 0.110 | 0.570 | 0.890 | 1.000 |

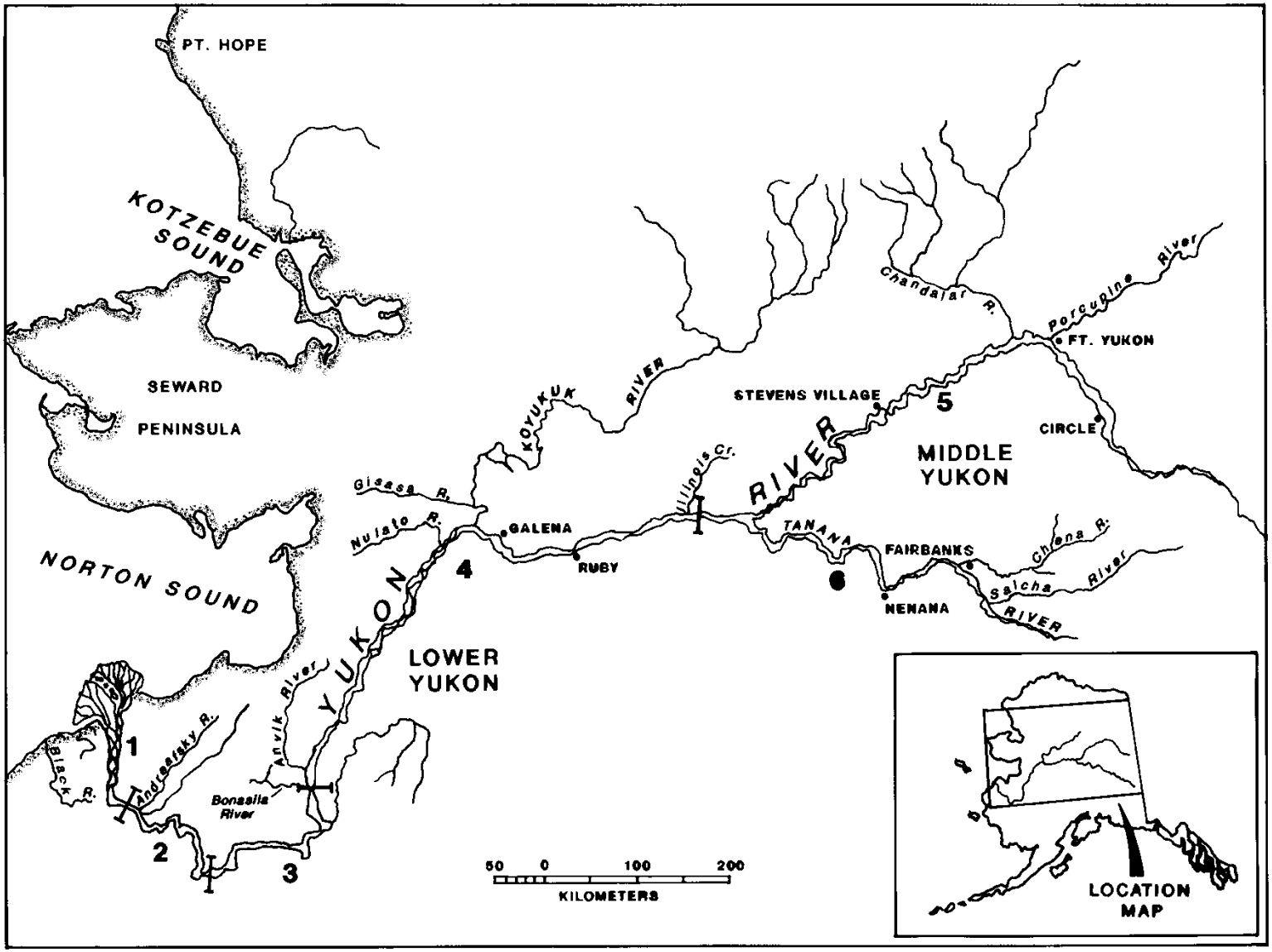



Figure 1.–Alaska portion of the Yukon River drainage with district boundaries and major spawning tributaries.

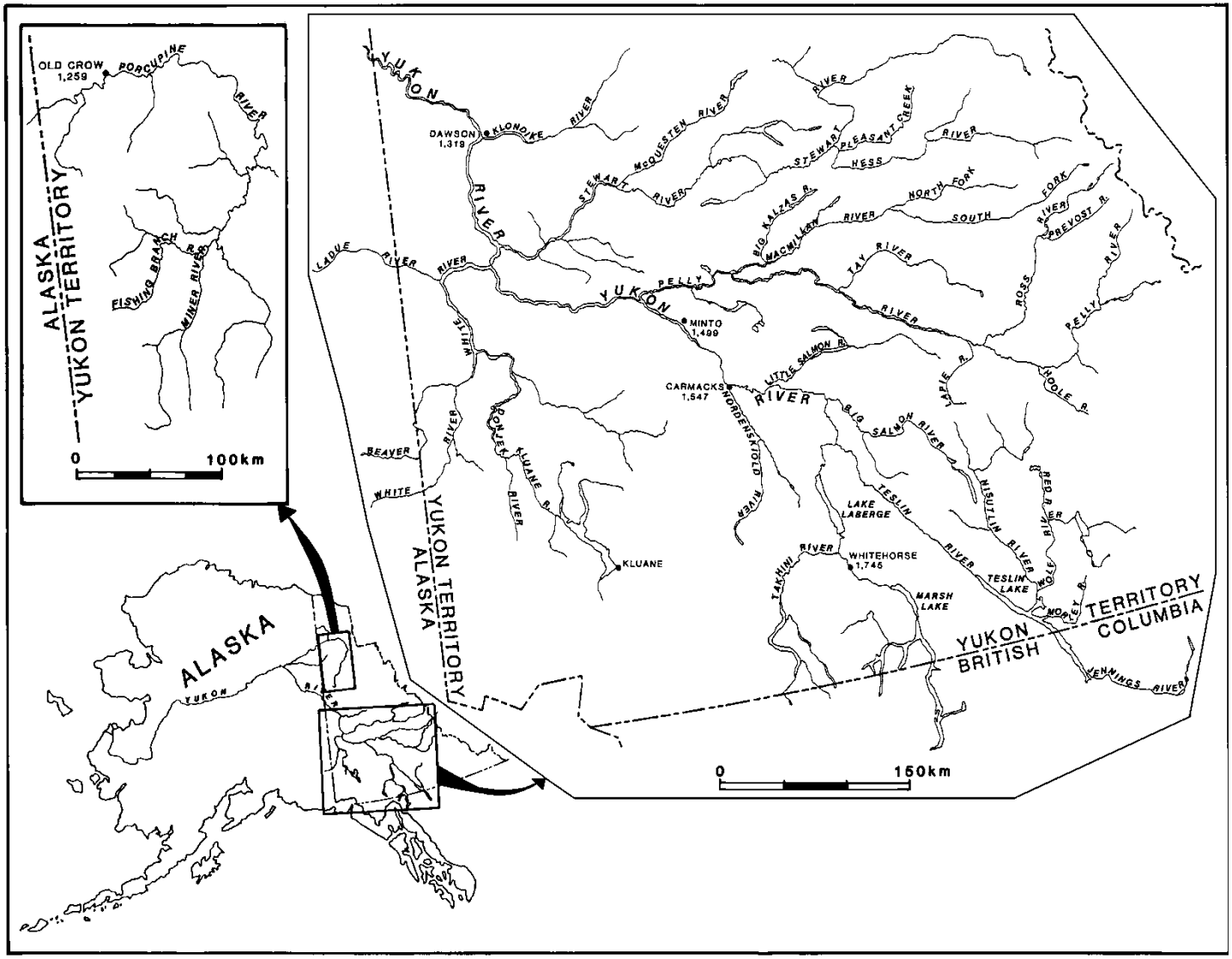



Figure 2.–Canada portion of the Yukon River drainage and major spawning tributaries.

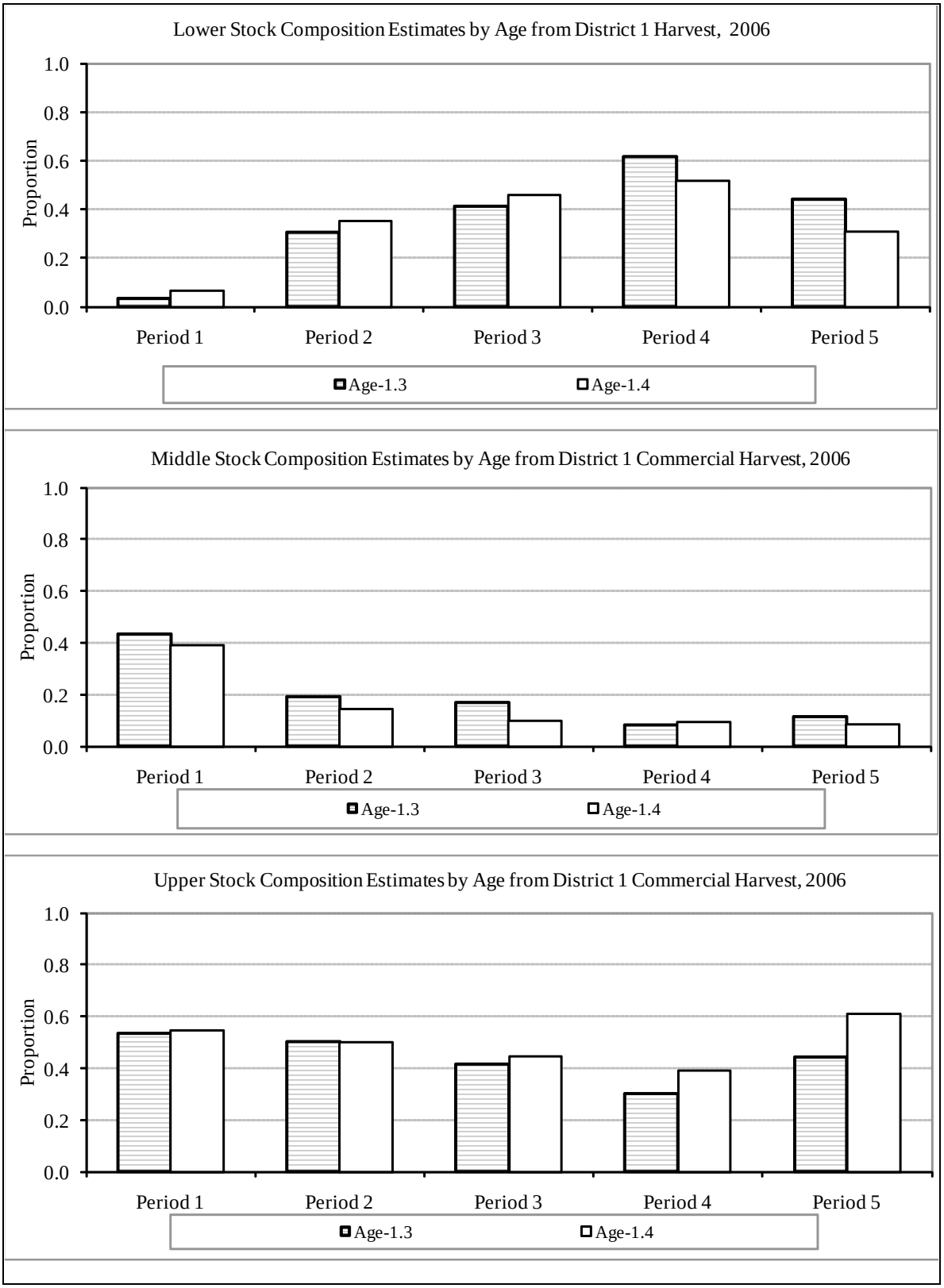



Figure 3.–Genetic stock composition estimates, by age and period, from Yukon River District 1 commercial harvest samples, 2006.

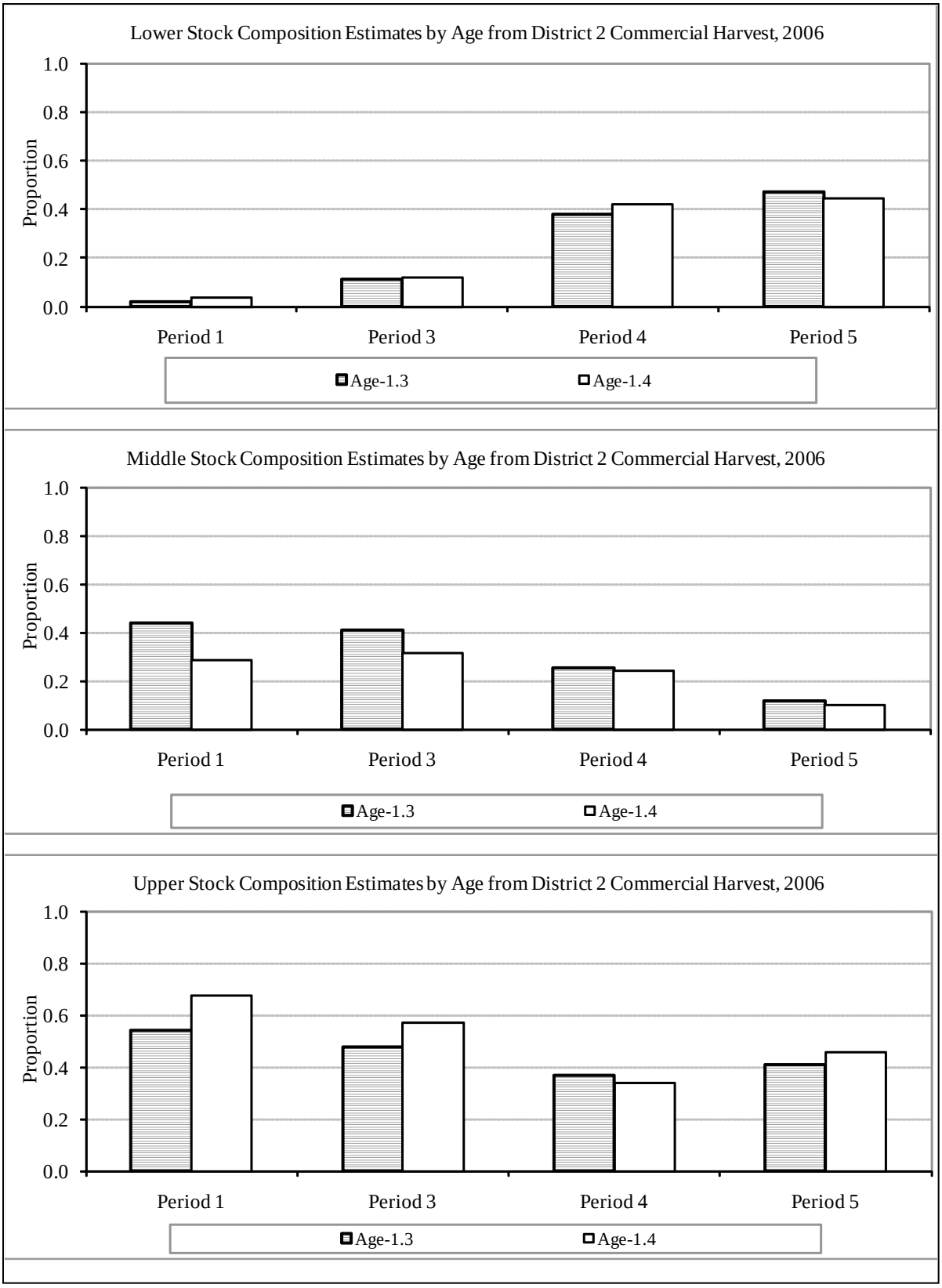
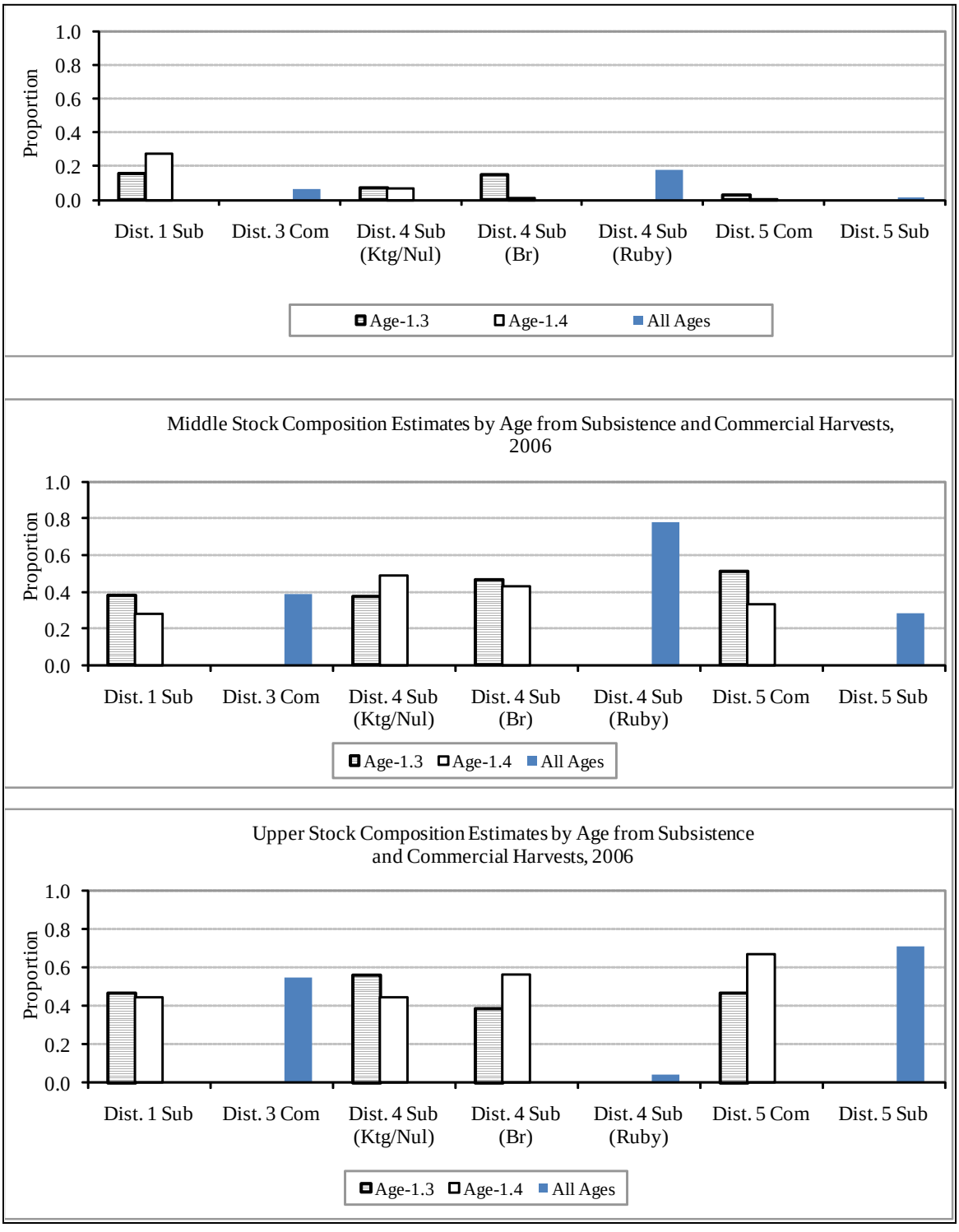



Figure 4.–Genetic stock composition estimates, by age and period, from Yukon River District 2 commercial harvest samples, 2006.




*Note*: In the District 4 subsistence samples, Ktg/Nul were from the villages of Kaltag and Nulato, Br were from Bishop Rock fishing location.

Figure 5.–Genetic stock composition estimates, by age and all ages combined, from Yukon River subsistence harvest samples in Districts 1, 4, and 5; and commercial harvest samples in Districts 3 and 5, 2006.

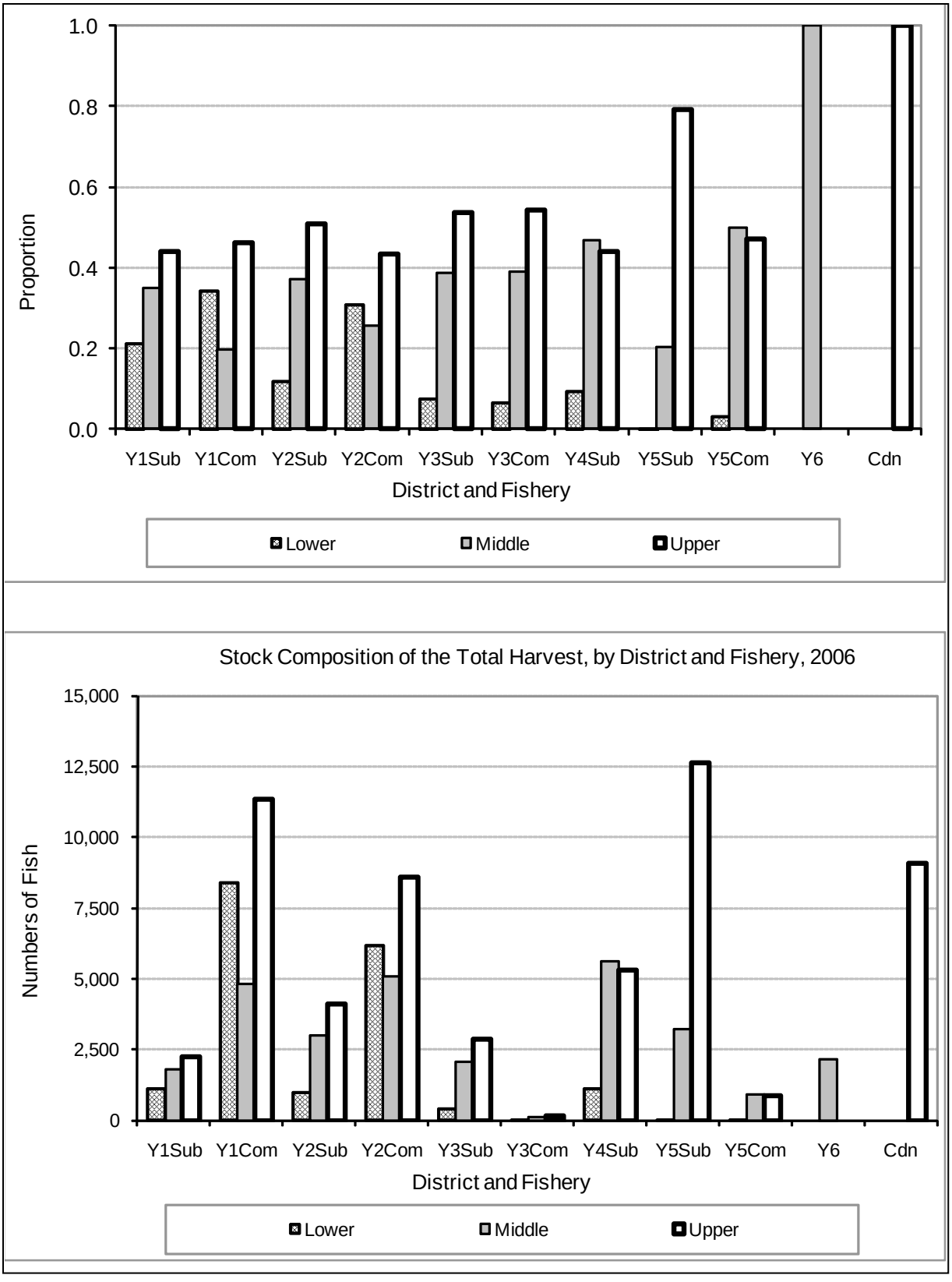



Figure 6.–Yukon River Chinook salmon total harvest stock composition, by district and fishery, in proportion (upper figure) and in numbers of fish (lower figure), 2006.